Aalto University
School of Chemical
Engineering

Heidi-Henrietta Saarikko

SELECTING AN IT SYSTEM FOR SUPPLIER RELATIONSHIP MANAGEMENT

Master´s Programme in Chemical, Biochemical and Materials Engineering
Major in Chemical and Process Engineering

Master's thesis for the degree of Master of Science in Technology submitted for inspection, Espoo, 11 February, 2020.

Supervisor	Professor Timo Seppälä
Instructor	M.Sc. Fredrik Calenius
	MBA Noora Peltonen

Aalto University
School of Chemical
Engineering

Aalto University, P.O. BOX 11000, 00076 AALTO
www.aalto.fi
Abstract of the master's thesis

Author Heidi-Henrietta Saarikko

Title Selecting an IT System for Supplier Relationship Management

Degree Programme Chemical, Biochemical and Materials Engineering

Major Chemical and Process Engineering **Code of major** CHEM3043

Supervisor Prof. Timo Seppälä

Advisors Fredrik Calenius, M.Sc. (Tech.) and Noora Peltonen, MBA

Date 4.2.2020 **Number of pages** 101 + 21 **Language** English

Abstract

There is an increased interest in supplier relationship management (SRM) since it has been identified that organizations have become more reliant on their suppliers in terms of firm performance. SRM has also been detected with the need for digitalization, but the difficulty nowadays is that there are a large number of commercially available software solutions by various companies capable of fulfilling the needs and requirements of an organization. Thus, an effort needs to be put into selecting the most suitable IT-provider and solution from all the competing alternatives.

The main objective of this thesis is to develop a model for IT procurement process. Two research methods were used. First, a literature review regarding supply chain management (SCM) and procurement, SRM and SRM systems, and IT procurement processes were done. Next, empirical research was conducted as an insider action research consisting of, e.g., interviews and workshops.

It was found that several benefits related to SRM and having an SRM system can be experienced. These benefits include on-going monitoring of the suppliers and their performance, coordinating and automating communication, increased transparency, and risk mitigation. Requirements for a system can be derived by, e.g., interviewing and workshopping with selected stakeholders. Requirements for a supplier can be determined based on literature and asking questions from the supplier regarding these criteria. An IT system can then be chosen through the steps of longlisting, shortlisting, and final selection. During these three steps, a request for information (RFI) document is comprised to score objective requirements, then a shortlist is composed based on the scoring, and these suppliers demonstrate their solution and provide references to score subjective requirements. One system under study appeared to satisfactorily meet the system and supplier requirements set by the case company.

The results imply that the IT procurement process model used in this thesis to select an SRM system for the case company is generalizable to selecting other IT systems as well. In the first step, preparations are done, i.e., a current state analysis, stakeholder identification, determining goals and vision, and assigning teams and their responsibilities. In the second step, the requirements for the system are defined by conducting a requirements engineering (RE) study. Also, the supplier requirements are defined. In the third step, an IT system is selected through longlisting, shortlisting and final selection based on the derived requirements. This three-step model should result in procuring an IT system that complies with the set requirements.

Keywords supplier relationship, supplier relationship management, SRM, procurement, purchasing, sourcing, IT system, supplier selection, supply chain management, SCM, requirements engineering

Aalto University
School of Chemical
Engineering

Aalto-yliopisto, PL 11000, 00076 AALTO
www.aalto.fi
Diplomityön tiivistelmä

Tekijä Heidi-Henrietta Saarikko

Työn nimi IT-systeemin valinta toimittajasuhteiden hallintaan

Koulutusohjelma Kemian-, bio- ja materiaalitekniikka

Pääaine Kemian- ja prosessitekniikka **Pääaineen koodi** CHEM3043

Työn valvoja Prof. Timo Seppälä

Työn ohjaajat Fredrik Calenius (dipl.ins.) ja Noora Peltonen (tradenomi, ylempi amk)

Päivämäärä 4.2.2020 **Sivumäärä** 101 + 21 **Kieli** englanti

Tiivistelmä

Koska organisaatiot ovat yhä enemmissä määrin riippuvaisia toimittajistaan, toimittajasuhteiden hallinnasta on tullut tärkeämpää. On myös tunnistettu, että toimittajasuhteiden hallinta on yksi osa-alue, jolla tarvitaan digitalisoitumista. Nykyään ongelmana kuitenkin on, että markkinoilla on useita systeemejä, jotka täyttävät organisaatioiden tarpeet ja vaatimukset koskien systeemejä. Siksi onkin tärkeää pystyä valitsemaan kaikista sopivin IT-palveluntarjoaja ja systeemi kilpailevista vaihtoehdoista.

Tämän diplomityön tarkoitus on kehittää malli IT hankintaprosessille. Tutkimuksessa käytetiin kahta tutkimusmetodia: kirjallisuuskatsaus ja empiirinen tutkimus. Kirjallisuuskatsaus käsittelee toimitusketjujen hallintaa ja hankintaa, toimittajasuhteiden hankintaa ja toimittajasuhteiden hankintaan käytettäviä systeemejä, sekä IT hankintaprosesseja. Empiirinen tutkimus toteutettiin sisäpiirin toimintatutkimuksena, joka koostui muun muassa haastatteluista ja workshopeista.

Tutkimuksen perusteella toimittajasuhteiden hallinta ja tähän käytettävä systeemin voivat tuoda useita hyötyjä. Näihin hyötyihin lukeutuvat muun muassa toimittajien ja heidän suoriutumisensa jatkuva seuranta, kommunikaation koordinointi ja automatisointi, lisääntynyt avoimuus, sekä riskien ehkäiseminen. Systeemin vaatimukset voidaan selvittää muun muassa haastattelemalla ja workshoppaamalla valittujen sidosryhmien kanssa. Palveluntarjoajan vaatimukset voidaan puolestaan määritellä kirjallisuuden avulla ja kysymällä palveluntarjoajilta kysymyksiä liittyen valittuihin kriteereihin. IT-systeemi voidaan sitten valita laatimalla laaja ehdokasluettelo, suppea ehdokasluettelo, ja tekemällä lopullinen valinta. Näiden kolmen vaiheen aikana laaditaan tietopyyntödokumentti objektiivisten vaatimusten pisteytystä varten, sitten laaditaan suppea ehdokasluettelo pisteytyksen perusteella, ja lopuksi ehdokkaat demonstroivat systeemiään ja antavat referenssit subjektiivisten vaatimusten pisteyttämiseksi. Tutkimuksessa yksi systeemi vastasi organisaation asettamia systeemin ja palveluntarjoajan vaatimuksia.

Tulosten mukaan tutkimuksessa käytetty malli IT hankintaprosessille, jonka avulla tutkimuksessa valittiin systeemi toimittajasuhteiden hallinnalle, on yleistettävissä muidenkin IT-systeemien hankintaan. Mallin ensimmäisessä vaiheessa tehdään analyysi nykyhetkestä, määritellään sidosryhmät, määritellään hankinnan tavoitteet ja vision, sekä määritellään tiimit ja niiden vastuut. Toisessa vaiheessa systeemin vaatimukset selvitetään vaatimusmäärittelyn kautta ja lisäksi palveluntarjoajaa koskevat vaatimukset määritellään. Kolmannessa vaiheessa IT-systeemi valitaan laatimalla laaja ehdokasluettelo, suppea ehdokasluettelo, ja tekemällä lopullinen valinta asetettujen vaatimusten perusteella. Tämän kolmivaiheisen mallin tulisi johtaa IT-systeemin hankintaan, joka vastaa parhaiten asetettuja vaatimuksia.

Avainsanat toimittajasuhteet, toimittajasuhteiden hallinta, SRM, hankinta, osto, IT systeemi, toimittajavalinta, toimitusketjujen hallinta, SCM, vaatimusmäärittely

Preface

This master's thesis was conducted in the autumn and winter of 2019/2020 for a case company. The project was one of the strategic projects for the case company's current strategy, supporting the company's strategic objective of continuous improvement. Working on this thesis has been a valuable opportunity to understand how to conduct a scientific study and how to select an IT system for supporting business processes.

Firstly, I want to thank my supervisor, Professor Timo Seppälä, for his support and feedback throughout the thesis process. I also want to thank my advisors, Fredrik Calenius and Noora Peltonen, for offering me an exciting topic and guiding me throughout the process. I would also like to thank my colleagues for the irreplaceable moments we have shared, and their enthusiasm and contribution to my research.

Also huge thanks to everyone involved with the project: purchasing, procurement, and R&D teams, and suppliers who took part in the study. Without you, this thesis would not have been possible to conduct. The insights and ideas gained were invaluable for the results of this thesis.

Finally, I want to express my gratitude to my family, friends, and boyfriend for their support and encouragement throughout my studies.

Helsinki, 4.2.2020

Table of Contents

List of Tables

List of Figures

Abbreviations

AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
COTS	Commercial Off-the-Shelf
CPO	Chief Procurement Officer
CSR	Corporate Social Responsibility
e.g.	exempli gratia
ERP	Enterprise Resource Planning
etc.	et cetera
F2F	Face-to-Face
GPM	Group Procurement Manager
i.e.	id est
IT	Information Technology
MCDM	Multicriteria Decision Making
OTD	On-Time-Delivery
PDM	Product Data Management
PM	Purchase Manager
R&D	Research & Development
RE	Requirements Engineering
RFI	Request for Information
RFP	Request for Proposal
RFQ	Request for Quotation
RQ	Research Question
SCM	Supply Chain Management
SIM	Supplier Innovation Management
SLM	Supplier Lifecycle Management
SRM	Supplier Relationship Management
SPM	Supplier Performance Management
TCO	Total Cost of Ownership
TOPSIS	Technique for Order Preference by Similarity to Ideal Solutions

1 Introduction

1.1 Motivation & Background

Due to megatrends, such as globalization and digitalization, marketplaces are facing continuous change, and the economic environment is becoming more complex and competitive. As organizations across all industries are looking for ways to stay competitive in the dynamic market, it has been identified that efficiencies need to be addressed in all management areas, including supply chain management (SCM). (Herrmann & Hodgson, 2001) SCM has been recognized to be a significant contributor to both strategic success and competitive advantage, and for SCM to be successful, the purchasing and procurement departments must be considered (Chepchumba Kosgei & Gitau, 2016; Park *et al.*, 2010).

Formerly, purchasing and procurement were treated as tactical functions that did not affect the overall company performance, and they were not identified to contribute to competitive advantage (Moeller, Fassnacht & Klose, 2006). However, this paradigm has shifted during the last decades due to increased outsourcing (Nix, 2001; Park & Krishnan, 2001) and the realization that up to 75 % of total costs are generated by spending on materials and services (Campelo Filho, 2009). Thus, purchasing and procurement do have a significant effect on the overall company performance, and the functions are nowadays considered to be strategic instead of tactic (Carr & Pearson, 1999). This paradigm shift has also resulted in an increased interest in supplier relationship management (SRM). It has been identified that organizations have become more reliant on their suppliers in terms of firm performance (PwC, 2013); thus, organizations are seeking closer relationships with their suppliers to sustain their competitive advantage and financial performance. Consequently, SRM is seen as one of the few remaining SCM topics that can still make a difference acting as a source for competitive advantage (PwC, 2013; Wu & Shen, 2006).

Since the relevancy of purchasing and procurement functions have significantly increased, multiple software tools have been developed to support these business operations (Herrmann & Hodgson, 2001). One of the activities that have been identified with the need for digitalization in this context is SRM. However, the difficulty is that nowadays, there are many commercially available software solutions by various companies capable of fulfilling the needs and requirements of an organization (Samvedi *et al.*, 2018; Soares, Batista & Ribeiro, 2017). Thus, a company needs to put effort into selecting the most suitable IT-provider and solution from all the competing alternatives that fulfill their specific needs and requirements (Oztaysi, 2014; Soares, Batista & Ribeiro, 2017). Consequently, a framework for IT procurement is essential for a successful result (Lee, 1998).

The purpose of this thesis is to understand the importance and benefits of SRM and SRM systems and study how an effective SRM system could be procured to derive a model for the IT procurement process. An abundant amount of literature is available related to different SRM activities, such as supplier selection, supplier development, and supplier performance management (Moeller, Fassnacht & Klose, 2006). Moreover, SRM has been a popular subject in both SCM and information systems literature (Kar & Pani, 2014). However, the literature is often focused on either some of the SRM activities separately or the benefits that an SRM system might bring in general. There seem to be no studies available having a holistic approach for procuring the most suitable SRM system for a company's needs. Even though there are studies about procurement and IT procurement, they seem to emphasize different parts of the processes. Thus, by addressing how to procure an SRM system, this thesis makes a relevant academic contribution to both SRM and IT procurement.

1.2 Research Problem & Questions

The objective of this thesis is ultimately to develop a model for the IT procurement process. To reach the objective, the benefits of implementing SRM practices and having a system to support the efforts need to be addressed. This will motivate and

highlight the need and importance of having an SRM system. The second step is to conduct a requirements engineering study to select a system that best satisfies the needs and requirements the stakeholders have for the new system. The last step towards achieving the objective is to carry out the selection process though methods of longlisting, shortlisting, and final selection.

The research problem is formalized as the following: *How should a company acquire an IT system?* The topic is especially relevant to the case company, as buying a system to achieve more effective SRM practices is one of the strategic projects of the case company's current strategy period.

To further illustrate the aim of the research, three research questions (RQs) were constructed to answer the research problem.

RQ1: *What kind of benefits does an implementation of SRM practices via a system provide?*
RQ2: *How to conduct a requirements engineering study for an IT system?*
RQ3: *How to select the most suitable IT-provider and a system from multiple available alternatives?*

The first RQ deals with SRM, SRM systems, and their benefits. Answering this question requires a deep understanding of the concept. The question is answered based on the literature review, and by investigating the existing SRM practices at the case company. Also, reference interviews conducted during the final selection step, which in part answers to RQ3, were used.

The second RQ maps the requirements engineering (RE) process. A prerequisite for answering this question is to understand the RE process and activities included in it. To answer this question, a literature review is done on RE, and the current RE process used at the case company is evaluated.

The third RQ aims to draw ideas from the existing literature to come up with a simple method for selecting the most suitable IT-provider and a system. By combining the answers to the RQs, the goal is to create an optimal model for IT procurement process that could be used systematically and corporate-wide in future IT investment projects.

1.3 Scope of the Thesis

The scope of this thesis is to focus on the importance of SRM, and on the IT procurement process. The scope was affected by the needs of the case company, as it wants to purchase an SRM system. The case company does have a framework for SRM, but it does not have a systematic, corporate-wide approach to IT procurement. Thus, the need has been identified to come up with a general model for the IT procurement process that could be used in later IT investment decisions.

The IT procurement process considered is based on the hypothesis that the case company will end up purchasing a commercial off-the-shelf (COTS) system offering solutions for SRM. This is the hypothesis since the case company does not have the time, resources, or knowhow to develop a system totally from scratch. As building applications and systems are not the case company's core business, it is advisable to outsource the solution from an IT-provider that has specialized in SRM systems (Heikkilä, Vuori & Laine, 2013; Lee, 1998). COTS systems are also more than adequate to support companies' business needs (Lee, 1998).

Since IT procurement is a multifaceted process that takes up a considerable amount of time, the case study will not involve activities after the IT-provider and the system selection, and the derived model is limited to activities until this point. Thus, the following activities are excluded from the study: negotiation, contracting, testing, and implementation. The study will instead come up with a model for the IT procurement process, execute it by selecting the most suitable SRM system, and provide insights to the case company to help it conduct systematic IT procurement processes in the

future. The derived IT procurement process model will help the case company to gather needs and requirements, gradually narrow the IT-provider and solution alternatives, and suggest steps to be taken and factors to be considered along the way.

1.4 Structure of the Thesis

The first chapter of this thesis will be concluded by explaining the structure of the thesis. In this chapter, the objectives, research problem, RQs, and scope have been introduced. These will guide the research.

The literature review is conducted in chapter 2. The literature review starts with addressing supply chain management (SCM), its definitions, and models. Next, procurement models are examined as well as the models for supplier selection and supplier lifecycle management. These will, in part, assist in answering RQ3. After this, SRM, its definition and benefits, and systems and their benefits are examined. This part of the research will help in answering RQ1. The literature review continues with the investigation of IT procurement practices and activities. This will assist in answering RQ2 and RQ3. After the literature review, the thesis proceeds to explain the research methods (chapter 3) used for conducting the empirical study.

The empirical part of the report is conducted in chapter 4. The study begins with investigating the current SRM practices implemented at the case company and contrasting them to the literature findings to provide answers to RQ1. After this, the IT procurement process suggested in the literature will be put to the test by starting with the RE phase. First, the current RE practices used at the case company are examined, and then they are reflected against the literature. This will answer RQ2. The process will move on to the IT-provider and system selection phase, answering to RQ3. Besides, reference interviews conducted during the final selection step were also used for answering to RQ1. The empirical chapter is concluded by summarizing the lessons learned from the study.

After the empirical part of the thesis follows the discussion and analysis in chapter 5 and conclusion in chapter 6. Figure 1.1 represents the relationship between the RQs and the structure of the thesis.

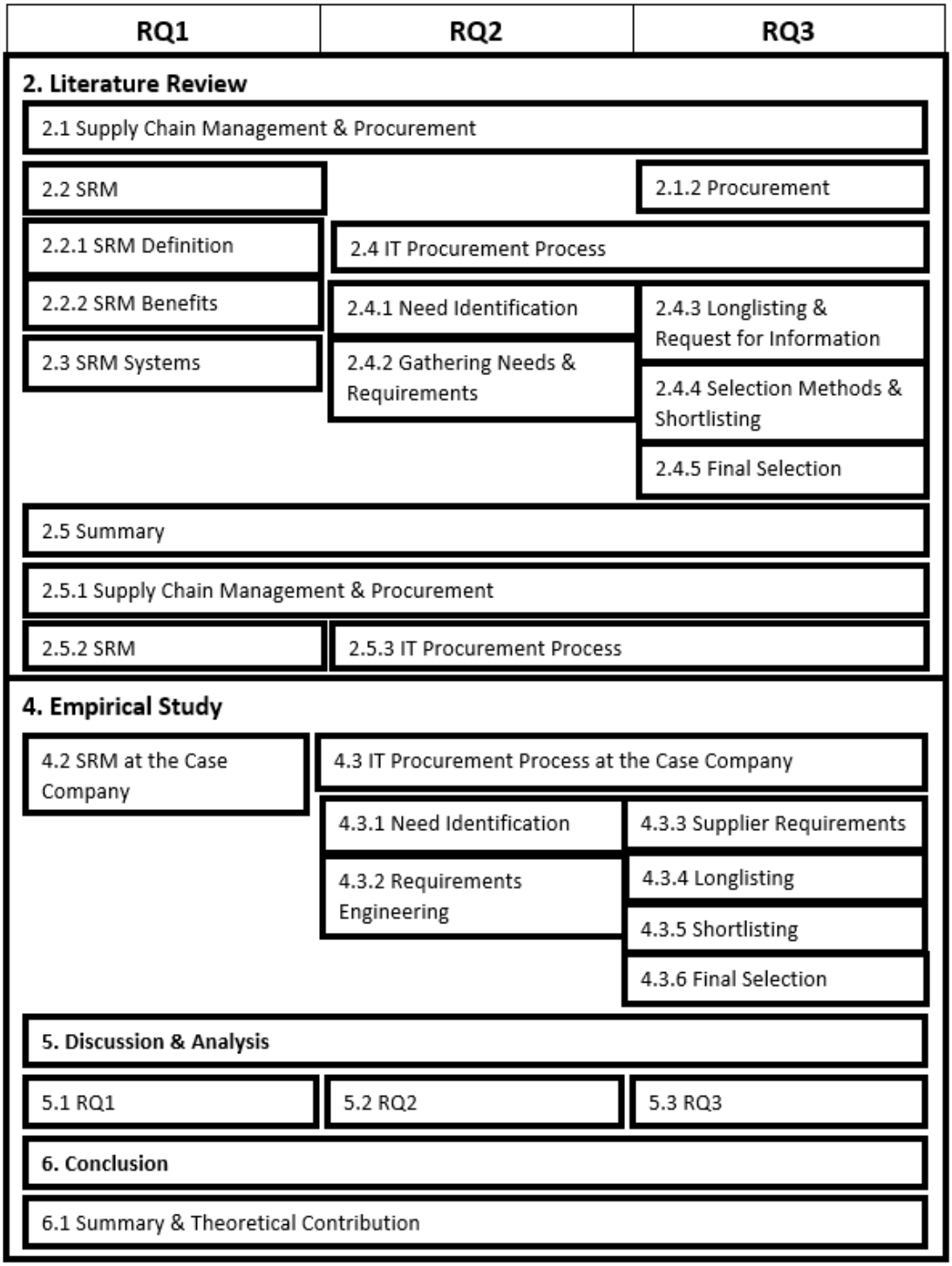

Figure 1.1 Relationship between the RQs and the structure of the thesis.

2 Literature Review

2.1 Supply Chain Management & Procurement

Marketplaces are facing continuous change due to megatrends, and thus the economic environment is becoming more complex and more competitive every day. In the dynamic market, organizations across all industries are looking for ways to stay competitive by addressing efficiencies in all management areas, including supply chain management (SCM). (Herrmann & Hodgson, 2001) The concept of SCM was introduced by consultants in 1980s, after which it has become an essential part of strategy (Mishra, 2007; Park & Krishnan, 2001) SCM is a significant contributor to both strategic success and competitive advantage, and for SCM to be successful, purchasing and procurement must be considered (Chepchumba Kosgei & Gitau, 2016; Park *et al.*, 2010).

Heretofore, purchasing and procurement were considered as tactical functions that did not have an effect on the overall company performance or the competitive advantage (Moeller, Fassnacht & Klose, 2006). The focus of these functions was often limited to merely reducing costs (Saad, Kunhu & Mohamed, 2016). However, this paradigm has shifted during the last decades because of two reasons. The first reason is that companies have started to increasingly outsource their noncore activities (Nix, 2001; Park & Krishnan, 2001). Indeed, by analyzing the cost structures of organizations, it is evident that up to 75 % of total costs are generated by spending on materials and services (Campelo Filho, 2009). Thus, purchasing and procurement do in fact have a significant effect on the company performance. The second reason is that the functions have been recognized to be the gateway between the suppliers and the internal functions (Moeller, Fassnacht & Klose, 2006), while also having a substantial effect on delivering customer value and satisfaction (Monczka, Trent & Handfield, 2005; Saad, Kunhu & Mohamed, 2016). These two reasons have caused purchasing and procurement to evolve from tactical into strategic, value-adding operations for organizations (Carr & Pearson, 1999).

2.1.1 Supply Chain Management

Several scholars have concluded that a clear understanding of SCM does not exist, and thus there is no universally accepted comprehensive definition or a model of SCM (Croom, Romano & Giannakis, 2000; Helou & Caddy, 2006; LeMay *et al.*, 2017; Mentzer *et al.*, 2001; Stock & Boyer, 2009; Sweeney, 2011). This is partly due to the antecedents of SCM, such as industrial economics, systems dynamics, marketing, purchasing, logistics, and organizational behavior, on which the concept is based on (Croom, Romano & Giannakis, 2000; Stock & Boyer, 2009). Additionally, the term SCM is used in a variety of different meanings and contexts, and there is several closely related terminology, which has also lead to the lack of clarity of the definition (Croom, Romano & Giannakis, 2000; Helou & Caddy, 2006; Sweeney, 2011).

The concept of supply chains is closely associated with SCM, and it has a reasonably uniform definition in use. For example, Mentzer *et al.* (2001) define it as: "*[A] set of three or more companies directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer*." Despite the clarity of supply chain definition, it is evident that the definitions of SCM vary widely in their nature, content, context, and scope (Helou & Caddy, 2006; Stock & Boyer, 2009). Some definitions concentrate on the entities of the supply chain, while others emphasize the flows and activities included in the processes (Chen & Paulraj, 2004; Mentzer *et al.*, 2001; Stock & Boyer, 2009). SCM has also been used in contexts related to business structures and management processes (Helou & Caddy, 2006). A few definitions of SCM found in the related literature are gathered in Table 2.1.

Table 2.1 SCM definitions.

Definition	**Source**
"SCM is the integration of key business processes from end-user through original suppliers that provides products, services, and information that add value for customers and other stakeholders."	Croxton *et al*. 2001
"SCM is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole."	Mentzer *et al.*, 2001
"SCM is proactively managing the two-way movement and coordination of goods, services, information, and funds from raw materials to the end-users."	Monczka, Trent & Handfield, 2005
"SCM is the management of a network of relationships within a firm and between organizations and business units consisting of material suppliers, purchasing, production facilities, logistics, marketing, and related systems that facilitate the forward and reverse flow of materials, services, finances and information from the producer to the final customer while adding value, maximizing profitability, and achieving customer satisfaction."	Stock & Boyer, 2009
"SCM is how supply processes and materials are managed within a company."	van Weele, 2010
"SCM is the design and coordination of a network through which organizations and individuals get, use, deliver, and dispose of material goods; acquire and distribute services; and make their offerings available to markets, customers, and clients."	LeMay *et al.*, 2017

In the literature, there are also some models explaining and illustrating the processes and flows included in SCM. However, as with the definition of SCM, even the models vary between the sources. Nevertheless, perhaps the two most known models are presented by Mentzer *et al.* (2001) and Croxton *et al*. (2001).

The model presented by Mentzer *et al.* (2001) in Figure 2.1 illustrates supply chain management as a pipeline, including relevant business functions and supply chain

flows that create customer value and satisfaction by flowing from the supplier to the customer. At the same time, customer value and satisfaction translate to the supply chain companies' competitive advantage and profitability. (Mentzer *et al.*, 2001)

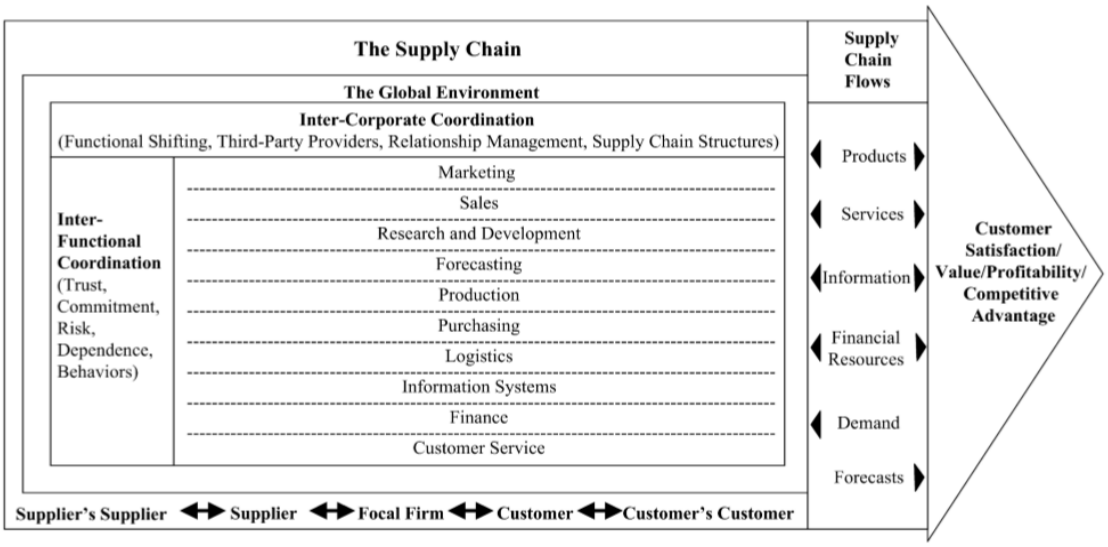

Figure 2.1 Model of supply chain management by Mentzer et al. (2001).

The model from Croxton *et al*. (2001) emphasizes eight key business processes that form the core of SCM. As presented in Figure 2.2, the business processes stretch through the whole supply chain and cut across companies and functions within it (Croxton *et al*. 2001).

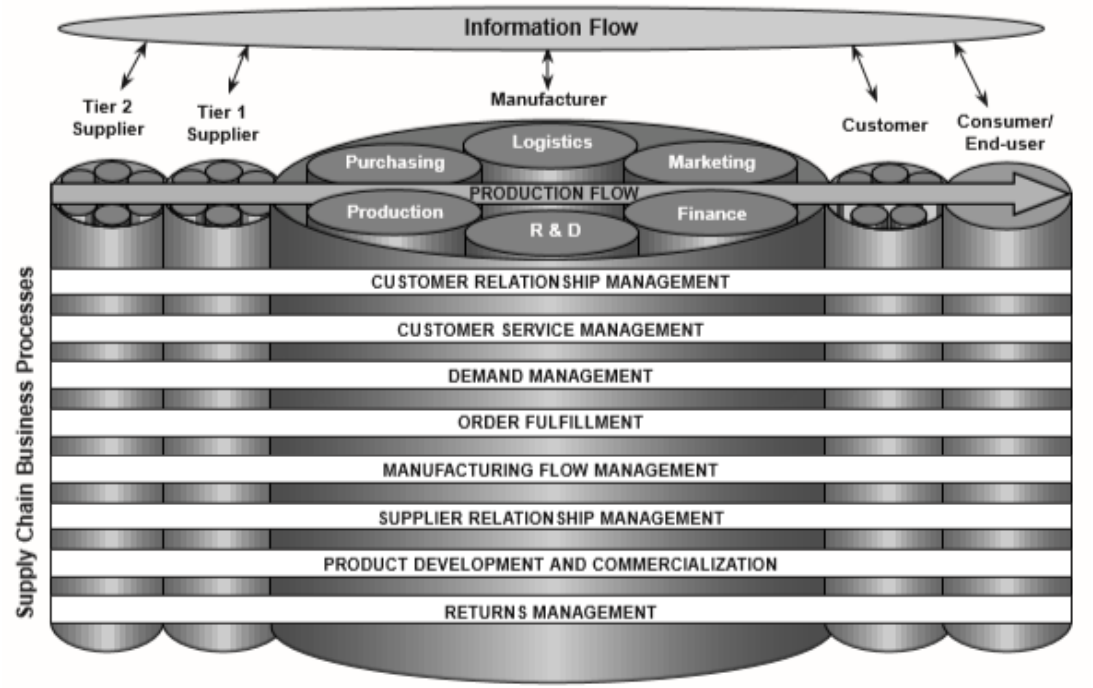

Figure 2.2 Model of supply chain management by Croxton et al. (2001).

2.1.2 Procurement

As SCM, there exists no agreement on the definitions of purchasing, sourcing, buying, or procurement, and they are often used interchangeably (van Weele, 2010). However, for clarity and the purpose of this thesis, I am going to use the term "procurement" when referring to processes and activities associated with obtaining goods or services.

According to van Weele (2010), the procurement process involves six steps: determining the needs, selecting the supplier, contracting, ordering, expediting, and follow-up and evaluation. The process model is illustrated in Figure 2.3. As the scope of this thesis does not include the steps starting from contracting, only the first three steps of the model are described.

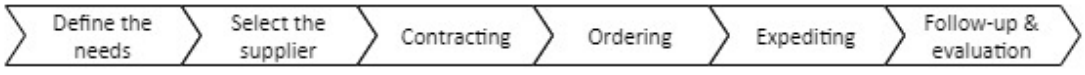

Figure 2.3 Procurement process model by van Weele (2010).

In the first step, the requirements for the goods or services need to be defined and specified. The second step is supplier selection, which is argued to be one of the most critical steps in the procurement process. In this step, first, requirements for the suppliers are formulated based on the specification made in the previous step. Next, a longlist of suppliers is comprised to indicate which supplier has the potential to meet the requirements. For the longlisted suppliers, a request for information (RFI) document is sent. Also, additional information relevant to the selection and references is requested. Based on the answers, the longlist of suppliers is reduced into a shortlist of the most promising suppliers. The shortlisted suppliers are then contracted by using a request for quotation (RFQ) document which is an invitation for the suppliers to submit their bid. The bids are compared and evaluated, and the final selection is made. (van Weele, 2010)

Van der Valk & Rozemeijer (2009) argue that procuring business services, such as IT systems, is substantially different from procuring goods. This is due to the characteristics of services that highlighting certain aspects more when compared with the procurement process of goods. Hence, van der Valk & Rozemeijer (2009) advice not to apply the procurement practices of goods directly to services. Their study indicates a variety of different aspects to be considered when procuring services as opposed to goods. These aspects include the difficulty of determining the quality of the service, risks in supplier and service specification and evaluation, relationship between the supplier and the buying company, cultural fit, and dispute resolution procedures of the supplier. Also, from the supplier's point of view, a thorough understanding of the customer's business is needed to be able to offer a suitable service. (van der Valk & Rozemeijer, 2009)

Based on their study, van der Valk & Rozemeijer (2009) modified the procurement process model presented by van Weele (2010). They also identified the same six steps in the process as in van Weele's model (2010), but they added two steps between the steps of defining the needs and selecting a supplier. These added steps are

request for information (RFI) and detailed specification (van der Valk & Rozemeijer, 2009) as illustrated in Figure 2.4. Both of these steps are, however, included in van Weele's model (2010) as embedment in the step of selecting a supplier. The motivation for separating them as their steps comes from their relative importance in the procurement process of services.

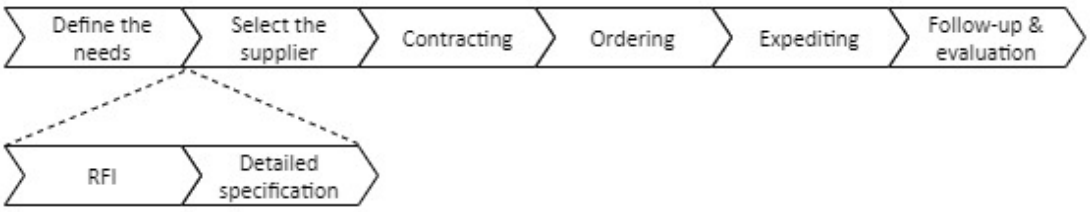

Figure 2.4 Procurement process model by van der Valk & Rozemeijer (2009).

2.1.2.1 Supplier Selection

Numerous scholars have acknowledged the importance of supplier selection, and they argue that it is the most critical step in the procurement process (Amid, Ghodsypour & O'Brien, 2006; Bhutta & Huq, 2002; Chen & Wang, 2009; Day & Barksdale, 1994; Monczka, Trent & Handfield, 2005; Smith, 2012; van Weele, 2010; Weber, Current & Benton, 1991). The importance of selecting the most suitable supplier is increasing as companies nowadays rely heavily on their suppliers (Osiro, Lima-Junior & Carpinetti, 2014). Suppliers have a direct impact on company performance as for many businesses purchases from suppliers account for the majority of costs (Mishra, 2007; Weber, Current & Benton, 1991), and suppliers are also in a vital role in achieving competitive advantage and delivering value to the end customers (Amid, Ghodsypour & O'Brien, 2006).

Day & Barksdale (1994, 2003) propose a decision-making model for supplier selection, which is presented in Figure 2.5. The model has many of the same elements as described in the first two steps in the procurement process presented by van Weele (2010) and the first four steps in the procurement process suggested by van der Valk & Rozemeijer (2009). The differences in the models are that the decision-

making model does not explicitly mention longlisting, and instead of an RFI document, a request for proposal (RFP) document is sent to the suppliers. Besides, presentation and interviewing step is added to the model. The second step in the model "identification of a consideration set" is comparable with the "detailed specification" step in the procurement process model by van der Valk & Rozemeijer (2009).

Figure 2.5 Decision-making model for supplier selection (adapted from Day & Barksdale, (1994, 2003)).

Several studies are devoted to examining supplier selection methods; however, there is no one best way to select a supplier that would fit every situation (Bayazit, 2006; Monczka, Trent & Handfield, 2005). The conclusion of the studies is that supplier selection is a multi-objective decision, and organizations use a variety of different approaches for completing the task (Bayazit, 2006; Bhutta & Huq, 2002; Monczka, Trent & Handfield, 2005; Weber, Current & Benton, 1991). The objective of the selection process is to define an order of preference among the potential suppliers to select the most suitable one (Osiro, Lima-Junior & Carpinetti, 2014). The final selection is ultimately based on those criteria that differ between the suppliers (Day & Barksdale, 2003).

There are several criteria suggested to be considered in supplier selection, and the importance of each criteria varies from a company and a project to another (Bhutta & Huq, 2002). The selection criteria found in the related literature are summarized in Table 2.2.

Table 2.2 Supplier selection criteria.

Selection criteria	**Source(s)**
Cost	Amid, Ghodsypour & O'Brien, 2006; Bayazit, 2006; Bhutta & Huq, 2002; Ellram, 1990; Mishra, 2007; Monczka, Trent & Handfield, 2005; Neely, Gregory & Platts, 1995; Nickson, 2008; Osiro, Lima-Junior & Carpinetti, 2014; Schiessl & Duda, 2007; Verma & Pullman, 1998; Weber, Current & Benton, 1991
Quality	Amid, Ghodsypour & O'Brien, 2006; Bhutta & Huq, 2002; Dahlberg, Saarinen & Mazurova, 2017; Ellram, 1990; Mentzer *et al.*, 2001; Mishra, 2007; Monczka, Trent & Handfield, 2005; Neely, Gregory & Platts, 1995; Nickson, 2008; Nix, 2001; Osiro, Lima-Junior & Carpinetti, 2014; van Weele, 2010; Verma & Pullman, 1998; Weber, Current & Benton, 1991
Delivery performance	Amid, Ghodsypour & O'Brien, 2006; Bayazit, 2006; Bhutta & Huq, 2002; Dahlberg, Saarinen & Mazurova, 2017; Mishra, 2007; Mentzer *et al.*, 2001; Monczka, Trent & Handfield, 2005; Neely, Gregory & Platts, 1995; Nickson, 2008; Osiro, Lima-Junior & Carpinetti, 2014; Verma & Pullman, 1998; Weber, Current & Benton, 1991
Geographical location	Osiro, Lima-Junior & Carpinetti, 2014; Weber, Current & Benton, 1991
Service & support	Amid, Ghodsypour & O'Brien, 2006; Bhutta & Huq, 2002; Day & Barksdale, 2003; Mishra, 2007; Monczka, Trent & Handfield, 2005; Neely, Gregory & Platts, 1995; Nickson, 2008; Nix, 2001; Osiro, Lima-Junior & Carpinetti, 2014; Schiessl & Duda, 2007; Weber, Current & Benton, 1991
Reliability	Dahlberg, Saarinen & Mazurova, 2017; Ellram, 1990; Mishra, 2007; Neely, Gregory & Platts, 1995; Nix, 2001

Selection criteria	Source(s)
Flexibility	Neely, Gregory & Platts, 1995; Nickson, 2008; Nix, 2001; Osiro, Lima-Junior & Carpinetti, 2014; Schiessl & Duda, 2007; Verma & Pullman, 1998
Technological capability	Bhutta & Huq, 2002; Ellram, 1990; Monczka, Trent & Handfield, 2005; Nickson, 2008; Nix, 2001; Osiro, Lima-Junior & Carpinetti, 2014; Schiessl & Duda, 2007; van Weele, 2010; Weber, Current & Benton, 1991
Relationship & communication with the supplier	Day & Barksdale, 2003; Ellram, 1990; Nickson, 2008; Nix, 2001; Mishra, 2007; Osiro, Lima-Junior & Carpinetti, 2014; Qiu *et al*. 2013
Reputation	Amid, Ghodsypour & O'Brien, 2006; Mishra, 2007; Nickson, 2008; Osiro, Lima-Junior & Carpinetti, 2014; Qiu *et al*. 2013; Weber, Current & Benton, 1991
Management capabilities	Dahlberg, Saarinen & Mazurova, 2017; Ellram, 1990; Monczka, Trent & Handfield, 2005; Nickson, 2008; Osiro, Lima-Junior & Carpinetti, 2014; van Weele, 2010; Weber, Current & Benton, 1991
Supplier's business strategy & processes	Dahlberg, Saarinen & Mazurova, 2017; Ellram, 1990; Monczka, Trent & Handfield, 2005; van Weele, 2010
Warranty & claims policy	Dahlberg, Saarinen & Mazurova, 2017; Nickson, 2008; Osiro, Lima-Junior & Carpinetti, 2014; Schiessl & Duda, 2007; Weber, Current & Benton, 1991
Financial capabilities	Dahlberg, Saarinen & Mazurova, 2017; Ellram, 1990; Monczka, Trent & Handfield, 2005; Nickson, 2008; Osiro, Lima-Junior & Carpinetti, 2014; van Weele, 2010; Weber, Current & Benton, 1991
Environmental regulation compliance	Monczka, Trent & Handfield, 2005; Osiro, Lima-Junior & Carpinetti, 2014

Selection criteria	Source(s)
Expertise	Dahlberg, Saarinen & Mazurova, 2017; Day & Barksdale, 2003; Nickson, 2008; van Weele, 2010; Weber, Current & Benton, 1991
Development capabilities	Dahlberg, Saarinen & Mazurova, 2017; Ellram, 1990

The suggested criteria frequently conflict with each other; thus, trade-offs should be addressed when selecting the criteria for a specific procurement (Amid, Ghodsypour & O'Brien, 2006; Bhutta & Huq, 2002; Karpak, Kumcu & Kasuganti, 2001). For each procurement, the criteria and their relative importance should be decided case by case (Bhutta & Huq, 2002; Nickson, 2008). The chosen criteria should reflect and be consistent with the specified needs that were defined in the first step of the procurement process (Nickson, 2008).

2.1.2.2 Supplier Lifecycle Management

When considering procurement, it is frequently advised to consider the lifecycle of the goods or the services being procured. Besides, as suppliers are vital for the buying company, it is also advised to consider the whole lifecycle of the supplier relationship when procuring goods or services (Ashok, 2019; Nickson, 2008). The idea behind this mindset is the philosophy of the total cost of ownership (TCO). Instead of considering merely the price of the purchase, procurement professionals should evaluate what are the total costs of selecting and maintaining the relationship with the supplier (Bhutta & Huq, 2002; Nickson, 2008; Nix, 2001). This requires evaluating the whole lifecycle, instead of focusing on the apparent upfront costs (Nickson, 2008).

Managing the suppliers and the relationship with them throughout the entire lifecycle is called supplier lifecycle management (SLM). Smith (2012) describes SLM is as being "*an end-to-end approach to managing suppliers in a transparent, structured, and integrated manner*." SLM entails all relevant aspects and activities associated with managing suppliers (Smith, 2012). There are a few SLM models presented in the

literature by Smith (2012), Ashok (2019), and Bhuvaneswaran (2019). Figure 2.6 represents an SLM model adapted from the four models.

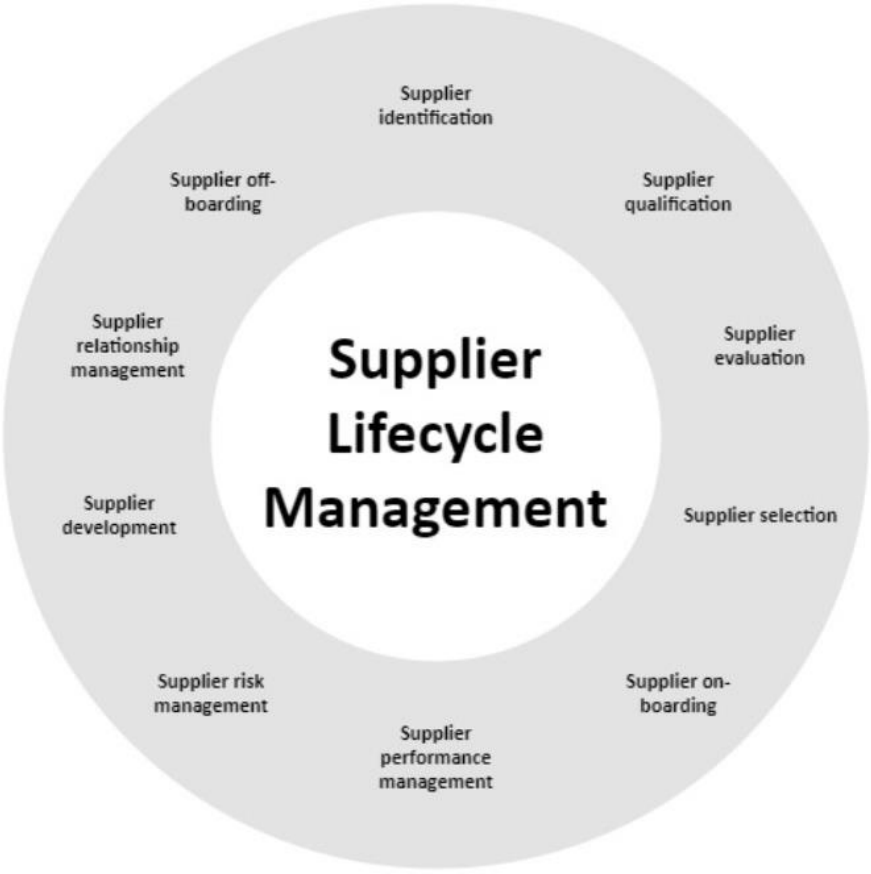

Figure 2.6 An SLM model (adapted from Smith (2012), Ashok (2019), and Bhuvaneswaran (2019)).

The first step in the SLM model is supplier identification, which is the process of listing the potential suppliers on to a longlist. The second step in the model is supplier qualification in which the criteria of the suppliers are assessed in terms of fulfilling the buying company's specific requirements. Based on this, a shortlist is comprised, and the model moves on to the third step of supplier evaluation. In this step the shortlisted suppliers are evaluated in-depth with specific methods and based on criteria chosen by the buying company. The result of the evaluation is the fourth step of supplier selection based on which the model moves on to supplier on-boarding, which is the fifth step in the model. After on-boarding, the supplier, information, and

data are beginning to be gathered. Based on the information, supplier performance management is carried out in the sixth step to measure and analyze the performance of the supplier, and to notice possible problems early on. The seventh step in the model is supplier risk management. The purpose of this step is to identify, analyze, and mitigate risks in the supply base. The eight-step is supplier development, in which regular feedback about the performance is given to the supplier to achieve improvements. Next in the model is supplier relationship management (SRM). The purpose of SRM is described to be the action of developing a mutually beneficial long-term relationship with the supplier to deliver a higher level of competitive advantage. The last step in the model is supplier off-boarding, which is the process of terminating the supplier relationship.

Ultimately, the purpose of SLM is to recognize the importance of suppliers as a source of value and realizing that value during the relationship while reducing associated risks and costs (Ashok, 2019; Smith, 2012). The holistic approach of managing suppliers and the relationship with them through SLM provides many benefits. These benefits include cost reductions, improved risk management and risk reductions, value gains by delivering higher value, internal efficiency gains, innovation, and overall improvements in the organization's performance (Ashok, 2019; Smith, 2012). SLM also acts as a useful information source for determining what needs to be done and achieved to make better decisions and to arrive at the best outcomes (Nickson, 2008).

2.2 Supplier Relationship Management

The paradigm shift addressed in Chapter 2.1 has also resulted in an increased interest in supplier relationship management (SRM). In the past, it was common to contract with many suppliers, however nowadays, contracts are made with fewer suppliers, and they are becoming increasingly long-term (Chen & Paulraj, 2004). Accordingly, it has been identified that organizations have become more reliant on their suppliers in terms of innovations, reliability of supply, sustainability, and cost savings (PwC,

2013). Thus, organizations are seeking to have closer relationships with their key suppliers to sustain their competitive advantage and financial performance through effective collaboration and communication (Campelo Filho, 2009; Chepchumba Kosgei & Gitau, 2016; Croom, Romano & Giannakis, 2000; Hardy, 2017; Herrmann & Hodgson, 2001; Lambert & Schwieterman, 2012; Moeller, Fassnacht & Klose, 2006; Wagner & Essig, 2006). Consequently, SRM is seen as one of the few remaining SCM topics that can still make a difference acting as a core competence and a source for competitive advantage (PwC, 2013; Wu & Shen, 2006).

2.2.1 Supplier Relationship Management Definition

SRM is not a new term anymore since it has been written in scientific articles for decades, and many companies have been including at least parts of it in their business practices (Schuh *et al.*, 2014). However, there is still not a single definition for the broad concept, and it is even used as a synonym for procurement (Mettler & Rohner, 2009; Schuh *et al.*, 2014).

Some definitions rely on describing what activities can be included under the SRM umbrella term. For example, Park *et al.* (2010) present that SRM includes shaping purchasing strategies, supplier selection, collaboration with the suppliers, supplier assessment and development, and continuous improvement. They have created a process flowchart for indicating how these SRM activities follow each other. This chart is presented in Figure 2.7.

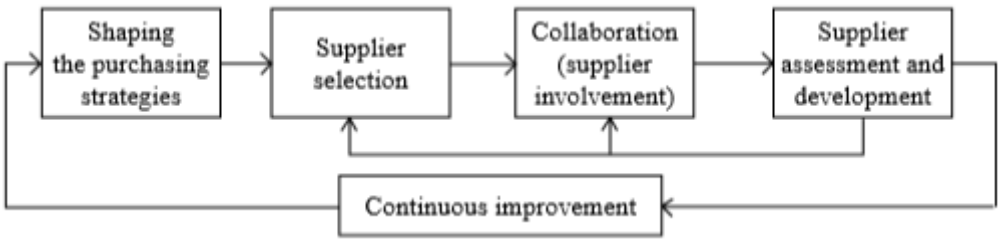

Figure 2.7 SRM process flowchart (Park et al., 2010).

Other definitions following Park *et al.* (2010) style of describing SRM activities include the ones presented in Table 2.3. From the descriptions, it is evident that SRM is a broad concept, and the activities involved in SRM vary to some extent from one source to another.

Table 2.3 SRM definitions by activities.

Definition	**Source**
"SRM includes the activities of identifying, qualifying, selecting, evaluating, developing, and certifying suppliers."	Carr & Pearson, 1999
"SRM is the process of finding and managing preferred suppliers and extracting the benefits of long-term supplier partnerships."	Herrmann & Hodgson, 2001
"SRM involves relatively wide processes, including the management of numerous suppliers, the delivery of products, and suppliers' reputation and abilities."	Wu & Shen, 2006
"SRM is the design, control, and development of a company's supplier portfolio and the relationships the company maintains with its suppliers."	Wagner & Essig, 2006
"SRM is the process of engaging in activities of setting up, developing, stabilizing, and dissolving relationships with suppliers to create and enhance value within the relationship."	Moeller, Fassnacht & Klose, 2006
"SRM includes planning and establishing policies on how to segment, evaluate, and manage suppliers."	Lee *et al.*, 2007
"SRM includes identification, evaluation, qualification, and termination of supplier relationships."	Campelo Filho & Stucky, 2007
"SRM practices include supplier segmentation, selection, evaluation, classification and development."	Schuh *et al.*, 2014

Further sources focus on the development and management aspect of supplier relationships. These include the definition from Lambert & Schwieterman (2012) that states, "*SRM is the business process that provides the structure for how relationships with suppliers are developed and maintained*." Another example is from PwC (2013): "*SRM is a systematic approach for developing and managing partnerships, which is focused on joint growth and value creation with a limited number of key suppliers based on trust, open communication, empathy, and win-win orientation*."

Besides, others emphasize communication and interaction when defining SRM. These definitions are gathered in Table 2.4.

Table 2.4 SRM definitions emphasizing communication and interaction.

Definition	**Source**
"SRM is the process that defines how a company interacts with its suppliers."	Croxton *et al.*, 2001
''SRM is the process through which a business systematically keeps track of its suppliers by managing the whole spectrum of relations between the two."	Lee *et al.*, 2007
"SRM is the part of SCM that deals with all aspects of the relationship, especially the structures and processes required for communication between companies and their suppliers."	Campelo Filho, 2009
"SRM is concerned explicitly with how an organization manages the relationships with its suppliers, which includes all interactions between the two."	Schuh *et al.*, 2014
"SRM is a comprehensive approach to managing a company's interactions with suppliers."	Chepchumba Kosgei & Gitau, 2016
"SRM is an approach to managing and interacting with suppliers."	Hardy, 2017

In this thesis, however, I am going to use the definition of Mettler & Rohner (2009) for SRM, as I find it to be the most holistic one: *"SRM is a comprehensive approach to enhance cooperation, coordination, and communication between the company and its suppliers to continuously improve efficiency of collaboration and concurrently enhance quality, security, and innovation."*

2.2.2 Supplier Relationship Management Benefits

Accessing the power of SRM is still an untapped territory in many organizations, even though there are several verified benefits associated with its implementation (Schuh *et al.*, 2014). These include improved financial performance, cost savings, improved product quality, and efficient processes. The benefits found in the related literature are summarized in Table 2.5.

Table 2.5 SRM benefits.

Benefit	**Source(s)**
Cost savings	Chen & Wang, 2009; Hardy, 2017; Herrmann & Hodgson, 2001; Mettler & Rohner, 2009; Park *et al.*, 2010; PwC, 2013; Schuh *et al.*, 2014
Improved financial performance	Campelo Filho, 2009; Carr & Pearson, 1999; Chepchumba Kosgei & Gitau, 2016; Hardy, 2017; Herrmann & Hodgson, 2001; Lambert & Schwieterman, 2012
Reduced risks	Chen & Paulraj, 2004; Hardy, 2017; PwC, 2013; Schuh *et al.*, 2014
Reliable supply	Al-Abdallah, Abdallah & Hamdan, 2014
Innovations	Hardy, 2017; Kaul, Feng & Mathiassen, 2012; Park *et al.*, 2010; PwC, 2013; Schuh *et al.*, 2014
Reduced working capital	PwC, 2013
Prevent reputation damage	PwC, 2013
Shorten time-to-market	Hardy, 2017; Kaul, Feng & Mathiassen, 2012; Park *et al.*, 2010; PwC, 2013
Improved product quality	Hardy, 2017; Herrmann & Hodgson, 2001; Kaul, Feng & Mathiassen, 2012; Mettler & Rohner, 2009; Park *et al.*, 2010; PwC, 2013; Schuh *et al.*, 2014
More efficient and streamlined processes	Chepchumba Kosgei & Gitau, 2016; Hardy, 2017; Lee *et al.*, 2007; Mettler & Rohner, 2009; Park *et al.*, 2010; PwC, 2013; Schuh *et al.*, 2014
Better contracts and deals	Kaul, Feng & Mathiassen, 2012; PwC, 2013
Better responsiveness to customer needs	Herrmann & Hodgson, 2001; PwC, 2013; Schuh *et al.*, 2014
Competitive advantage	Chen, Lin & Huang, 2006; Chen & Wang, 2009; Hardy, 2017; Herrmann & Hodgson, 2001; Park *et al.*, 2010; Wu & Shen, 2006

2.3 Supplier Relationship Management Systems

As companies are aiming to stay ahead of their competition in the dynamic global marketplace, they have identified that traditional management practices are not enough to sustain a competitive advantage (Campelo Filho, 2009; Gunasekaran & Ngai, 2004). Due to the diminishing borders between nations and organizations, and the increasing complexity of corporate networks, information has become the most valuable asset for success. Consequently, the utilization of information technology (IT) for supporting business operations, such as SCM, has turned out to be an essential element of corporate strategy and modern management practices (Campelo Filho & Stucky, 2007; Campelo Filho, 2009).

Implementing an IT system improves information sharing and knowledge exchange both inside and outside of an organization, which are core activities for achieving closer collaboration, increased transparency, and a healthier relationship with the suppliers (Gunasekaran & Ngai, 2004; Kaul, Feng & Mathiassen, 2012; PwC, 2013; Samvedi *et al.*, 2018). In a supply chain, several information flows, relating to both financial and material flows, are present. Consequently, IT systems are especially important in supply chains as they integrate data from multiple access points and distribute it to the entities needing the information. (Samvedi *et al.*, 2018)

Since the relevancy of purchasing and procurement functions have significantly increased, multiple software tools have been developed to support these business operations (Herrmann & Hodgson, 2001). These solutions can improve the efficiency and effectiveness of work, reduce risks, and enhance opportunities for innovation with the suppliers. Because automating processes also frees time for the purchasing and procurement professionals, they can concentrate more on strategic activities instead of manual, routine work. Thus, digitalizing purchasing and procurement processes have both economic and strategic benefits. (Radell & Schannon, 2018)

One of the activities that have been identified with the need for digitalization in this context is SRM. There are several reasons for this. Firstly, SRM involves complex business processes, and the implementation of IT makes it easier to handle them (Wu & Shen, 2006). Secondly, the more suppliers a company has, the harder it is to keep track of all of them without a system (Hardy, 2017). And lastly, relationships with the suppliers are highly interactive, and they require constant monitoring and evaluation, in which an SRM system would be able to assist (Chepchumba Kosgei & Gitau, 2016).

There are several benefits associated with implementing an SRM system. These include coordinating and automating communication, on-going monitoring of the suppliers and their performance, and automating the daily purchasing and procurement activities. Table 2.6 summarizes the benefits identified in the literature.

Table 2.6 SRM system benefits.

Benefit	**Source(s)**
Coordinates and automates communication	Campelo Filho & Stucky, 2007; Campelo Filho, 2009; Carr & Pearson, 1999; Hardy, 2017; Kaul, Feng & Mathiassen, 2012
All supplier information in one centralized place	Hardy, 2017; Schuh *et al.*, 2014
On-going monitoring of the suppliers and their performance	Bemelmans *et al.*, 2012; Carr & Pearson, 1999; Herrmann & Hodgson, 2001; Kaul, Feng & Mathiassen, 2012; Makkonen & Vuori, 2014; Schuh *et al.*, 2014
Automates daily purchasing and procurement activities, which increases efficiency	Carr & Pearson, 1999; Lee *et al.*, 2007; PwC, 2013; Ruhi & Turel, 2005; Samvedi *et al.*, 2018; Stump & Sriram, 1997
Mitigates risk	Hardy, 2017; Schuh *et al.*, 2014
Increases transparency	Hardy, 2017; Kaul, Feng & Mathiassen, 2012; PwC, 2013; Schuh *et al.*, 2014
Accurate and timely information	Samvedi *et al.*, 2018

It is estimated that soon, most of the organizations will have a 360-degree view of their suppliers by having both internal data from the company and external data from

the suppliers and the market. Consequently, organizations will have not only historical data about their suppliers' performance, but they will also be able to compose holistic risk profiles and predict risk events. (EY Global, 2018) As a growing number of organizations are implementing digital purchasing and procurement solutions, those organizations that choose to stay on the side-lines of the transformation will quickly become less competitive (Radell & Schannon, 2018).

2.4 IT Procurement Process

Nowadays, the markets are flooded with several systems capable of fulfilling the needs of an organization. In other words, technologies have become standardized, and they are increasingly available to all companies. (Samvedi *et al.*, 2018; Soares, Batista & Ribeiro, 2017) A company needs to put an effort in selecting the most suitable system from all the competing alternatives to fulfill their specific needs and criteria (Oztaysi, 2014; Soares, Batista & Ribeiro, 2017). Thus, a framework for the IT procurement process is fundamental for a successful decision (Lee, 1998).

There are several IT procurement processes presented in the literature, but the most comprehensive one is given by Wakeford (2012). The process is divided into twelve steps:

1. Need identification
2. Define selection parameters
3. Gather needs and requirements
4. Draft a request for information (RFI) document
5. Agree on the longlist of candidates
6. Issue RFI to the longlist
7. Agree on the review criteria
8. Reduce the longlist to a shortlist of candidates
9. In-depth investigation of the shortlisted candidates
10. Decide the preferred IT-provider

11. Negotiation and contracting
12. Implementation

The IT procurement process by Wakeford (2012) is used as a starting point on which to build on based on the other literature findings. However, negotiation, contracting, and implementation are out of the scope of this thesis, and thus, they will not be covered.

2.4.1 Need Identification

When a company has identified a need for a new IT investment, it is first critical to fully understand the objectives and the expected outcomes of the investment. Even though these are likely to be described in a reasonably high-level manner, it is nonetheless essential to understand these factors before proceeding, as they will affect gathering needs and requirements later. (Wakeford, 2012)

At the beginning of an IT procurement process, it should also be decided on who is involved in the process. The decision on who is included in the process depends on the situation, but often, all the relevant stakeholders should have a chance to participate (Heikkilä, Vuori & Laine, 2013; Wakeford, 2012). When considering the stakeholders, it should be considered that the people ought to represent different functions and levels of seniority (Heikkilä, Vuori & Laine, 2013; Tate, 2015). This will mitigate the risk of missing some of the needs and requirements stakeholders have for the new system, which would ultimately lead to an undesired system to be purchased (Kujala, 2008; Tate, 2015; Wakeford, 2012). It is worth to note that one of the leading causes of an IT project failure is the lack of early user involvement (Kujala, 2008).

2.4.2 Gathering Needs & Requirements

Requirements are defined at the beginning of an IT procurement process, as they specify what kind of system should be purchased (Kotonya & Sommerville, 2002; Sommerville & Sawyer, 2004). It is crucial to define requirements in a precise and comprehensive manner, as the most frequent explanation for IT project failure is ill-defined requirements (Tate, 2015). Thus, getting the needs and requirements right early on will save wasted efforts and expenses down the line (Nickson, 2008). Indeed, for any procurement, may it be goods or services, such as an IT system, the expenses of getting the procurement wrong will increase with time, as indicated in Figure 2.8.

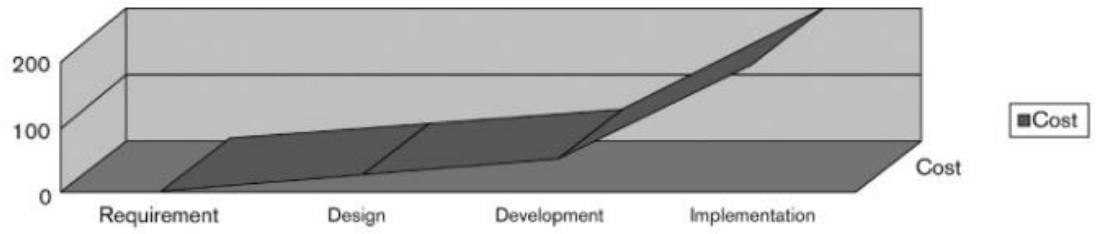

Figure 2.8 The cost of change versus time (Nickson, 2008).

From the figure, it is evident that the expenses of making changes to something that is being procured when the process is nearly completed are much more expensive than making those changes at the beginning. Once the implementation stage is reached, the expenses ramp up dramatically. Consequently, identifying needs and requirements and making changes during that stage is advised. (Nickson, 2008) Requirements are descriptions of *what* the system should do, not *how* it should be done (Kotonya & Sommerville, 2002; Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004). They can be anything from a user-level function to a general system property or a constraint for the system (Kotonya & Sommerville, 2002; Sommerville & Sawyer, 2004).

The process by which the needs and requirements are gathered is called requirements engineering (RE). It covers all the activities involved in discovering, documenting, and maintaining the requirements for an IT system (Kotonya &

Sommerville, 2002; Sommerville & Sawyer, 2004). The objective of including RE into the early stages of an IT procurement process is the gained notion of what kind of system should be purchased. By doing so, later discoveries of mistakes and costly rework can be prevented. (Paetsch, Eberlein & Maurer, 2003) The RE process consists of three main activities: requirements elicitation, requirements analysis, and requirements validation (Kotonya & Sommerville, 2002; Sommerville & Sawyer, 2004). In addition to these primary activities, there are two supporting activities: requirements documentation and requirements management (Paetsch, Eberlein & Maurer, 2003).

Requirements elicitation is a process of discovering the requirements by consulting stakeholders (Kotonya & Sommerville, 2002; Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004). There are several techniques that can be used for requirements elicitation, such as interviews, workshops, use cases, online surveys, reusing standard requirements from previous studies, and observation (Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004; Tate, 2015; Wakeford, 2012). All of the techniques have their strengths and weaknesses, and the researcher should choose the most suitable ones to be used on a specific project (Wakeford, 2012). Perhaps the most used technique is interviewing the stakeholders. The advantage of interviews is that they give a comprehensive collection of information. However, the drawback is that the data is qualitative, which is more challenging to analyze than quantitative data. (Paetsch, Eberlein & Maurer, 2003) Another frequently used technique is compiling the use cases. They are simulated examples of interactions between the system users and the system, that focus on what the users want the system to be able to do in each situation. (Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004)

After the initial requirements have been discovered as a result of requirements elicitation, the requirements are analyzed. Requirements analysis is a process for checking the requirements for necessity, consistency, completeness, and feasibility

(Paetsch, Eberlein & Maurer, 2003). Any conflicts, overlaps, and inconsistencies are resolved by prioritizing and grouping the requirements (Sommerville & Sawyer, 2004). There are several ways to prioritize requirements, but perhaps the most used one is to categorize them into mandatory, important, and nice to have classes (Wakeford, 2012). The priority classes reflect the importance of the requirements to the stakeholders and the overall success of the IT project (Sommerville & Sawyer, 2004). Mandatory requirements are those that the new system has to meet, or the system will not be considered. Necessary requirements would be beneficial to be met, but not fulfilling these requirements will not lead to an automatic rejection. Lastly, nice to have requirements would be useful to have, but they do not affect the outcome if they are not met. (Wakeford, 2012) To continue, grouping the requirements also helps in the analysis (Sommerville & Sawyer, 2004; Tate, 2015). There are a few ways of doing this, but one method that is often used is to group the requirements into functional and non-functional categories. Functional requirements describe *what* the system should do, while the non-functional requirements describe *how* the system does these (Wakeford, 2012).

The last main activity in the RE process is requirements validation. The purpose of requirements validation is to validate the consistency and completeness of the requirements for the system to be implemented (Kotonya & Sommerville, 2002; Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004). The technique by which to achieve validation is to review, refine and agree on the requirements, which is done iteratively during the RE process (Paetsch, Eberlein & Maurer, 2003; Tate, 2015; Wakeford, 2012).

Requirements documentation and requirements management are supporting activities for the RE process. The purpose of a requirements document is to communicate the requirements between the stakeholders and the IT-providers (Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004). The requirements document will also act as a critical input for a request for information (RFI) document

and evaluation criteria in the later stages of the IT procurement process (Wakeford, 2012). The document will also form the basis for negotiation and resolving any arising disputes later (Nickson, 2008). The purpose of requirements management is to detect, store, spread, and manage information. The activities included in requirements management are version control, requirements tracing, and requirements status tracking. (Paetsch, Eberlein & Maurer, 2003)

2.4.3 Longlisting & Request for Information

After gathering the needs and requirements, it is time to comprise a longlist. The longlist is a list of potential IT-providers and their solutions, on which more research needs to be done to identify the best option. The length of a longlist depends on the situation, but as a rule of thumb, it should be short enough to be manageable and long enough to be credible. (Tate, 2015) There are several sources and techniques for comprising a longlist, such as doing an Internet search, current providers, trade shows, references from colleagues and other contacts, and direct contact from the providers or their sales representatives (Heikkilä, Vuori & Laine, 2013; Monczka, Trent & Handfield, 2005; Tate, 2015; Wakeford, 2012).

Moving from a longlist to a shortlist requires sending out a request for information (RFI) document to the longlisted candidates. The objective of an RFI document is to enable the researcher to evaluate the candidates, and eventually eliminate the unsuitable ones to reach a shortlist of the most potential candidates. (Tate, 2015) In essence, the RFI document helps to identify which candidates are competent enough the provide the needed system based on specific evaluation criteria (Heikkilä, Vuori & Laine, 2013). The RFI document is drafted based on the requirements document (Heikkilä, Vuori & Laine, 2013; Wakeford, 2012). The requirements document is used for forming RFI questions that could reveal differences between the candidates' abilities (Tate, 2015). Once the RFI document has been drafted, all the longlisted candidates are contacted. After the initial contact, the document is sent out. Then,

based on the responses, the candidates are evaluated against specific criteria, and the shortlist is comprised. (Heikkilä, Vuori & Laine, 2013; Wakeford, 2012)

2.4.4 Selection Methods & Shortlisting

Once the responses to the RFI document are received, they are evaluated against specific criteria to reach the shortlist of candidates. There are three ways in which the assessment can be done. The first one is to use a narrative assessment. In this method, narrative notes are used against each criterion without giving quantitative scores. The second method is basic scoring, in which each criterion is given a score from a particular range. (Wakeford, 2012) The last one is weighted scoring, in which the criteria are weighted to reflect the importance of them against the requirements (Heikkilä, Vuori & Laine, 2013; Wakeford, 2012). Weighted scoring is the most used method out of the three, as it provides an analytical approach to the selection process that is, at the same time, consistent, transparent, and fair (Soares, Batista & Ribeiro, 2017; Tate, 2015).

Most of the scoring methods presented in the literature belong to a multicriteria decision making (MCDM) domain, which is a methodology that can consider multiple criteria at the same time (Li, Jin & Wang, 2014; Oztaysi, 2014). These include analytic hierarchy process (AHP), analytic network process (ANP), technique for order preference by similarity to ideal solution (TOPSIS), Delphi method, and data envelope analysis (Li, Jin & Wang, 2014; Oztaysi, 2014; Samvedi *et al.*, 2018; Soares, Batista & Ribeiro, 2017). These techniques have been tested extensively; however, they require trained experts to conduct the process (Soares, Batista & Ribeiro, 2017). Instead, a simple alternative of a scoring method is presented by Soares, Batista & Ribeiro (2017).

The proposed method by Soares, Batista & Ribeiro (2017) consists of creating an RFI document with binary questions, where a positive answer translates to being compliant with a particular requirement. The responses are used for analyses and

comparisons between the candidates. To calculate the result, each answer translates to 0 or 1, where 1 means the question has a positive response. The items are grouped into suitable categories, and each group is assigned an average of the values, which gives a total value between 0 and 1. When all the group scores are calculated, the final score of the solution is comprised of taking the average of the group scores, and the final score is still between 0 and 1. The final scores indicate how compliant the different solutions are in terms of the requirements covered in the RFI document. (Soares, Batista & Ribeiro, 2017)

When the scoring is done, the candidates are compared with each other to eliminate the ones that would not be able to implement the wanted system. The resulting shortlisted candidates are then investigated in-depth to make the final selection. (Wakeford, 2012)

2.4.5 Final Selection

When the shortlist is comprised, the next step is to conduct a comprehensive investigation of the remaining candidates. The activities include pitch/demonstration meetings and reference interviews (Wakeford, 2012).

A pitch meeting is an opportunity for the candidate to introduce their offering in more detail by holding a presentation and a demonstration at the customer's premises (Heikkilä, Vuori & Laine, 2013; Wakeford, 2012). The objective of a pitch meeting and a demonstration is to ensure that the promises given in earlier stages hold in reality. Each candidate will show several essential features of their system, and the participating stakeholders will score the features against the requirements. In demonstrations, especially subjective requirements, such as usability, are evaluated. (Tate, 2015)

Each candidate should provide the researcher with at least one reference that is of similar size and complexity as the customer, and that is using the same system

(Wakeford, 2012). The reference sites should be consulted by visiting the site or by conducting a telephone or an online interview (Tate, 2015; Wakeford, 2012). Visiting the sites can be useful if the sites are willing to show how the system works for them (Wakeford, 2012). However, the visits are more time-consuming, more difficult to arrange, more intrusive, and it will result in only a little additional information compared to the telephone or the online interview. Thus, it is advised to favor phone or online interviews. When conducting the interview, the focus should be on the aspects that have not been suitable for evaluation via the previous methods. (Tate, 2015) These aspects include the relationship with the IT-provider, support from them, their capabilities, and usability of the system (Tate, 2015; Wakeford, 2012).

Once the two activities are done, the investigation is complete, and a preferred IT-provider should be solved (Wakeford, 2012).

2.5 Summary

2.5.1 Supply Chain Management & Procurement

A clear understanding of SCM does not exist; thus, there is no one mutually accepted definition or a model of SCM. Some SCM definitions concentrate on the entities of the supply chain, while others emphasize the flows and activities included in the processes. For this thesis, the SCM definition by Monczka, Trent & Handfield (2005) is used: *"SCM is proactively managing the two-way movement and coordination of goods, services, information, and funds from raw materials to the end-users."*. There are also some models illustrating the processes and flows included in SCM, but they also vary between sources.

The same veil of unclarity applies to the definitions of purchasing, sourcing, buying, and procurement, as there is no one clear definition or established the difference between the concepts available. For this thesis, the term "procurement" is used when referring to processes and activities associated with obtaining goods or

services. According to van Weele (2010), the procurement process involves six steps: determining the needs, selecting the IT-provider, contracting, ordering, expediting, and follow-up and evaluation. However, van der Valk & Rozemeijer (2009) argued that procuring business services, such as IT systems, is substantially different from procuring goods. Consequently, they modified the procurement process model presented by van Weele (2010) by adding two steps to the process between the steps of defining the needs and selecting an IT-provider. These added steps were RFI and detailed specifications.

Supplier selection is argued by many to be the most critical step in the procurement process. Day & Barksdale (1994, 2003) have proposed a decision-making model for supplier selection, which has the majority of the same elements as described at the beginning of the procurement processes presented by van Weele (2010) and van der Valk & Rozemeijer (2009). The main difference is that the decision-making model does not explicitly mention longlisting, and instead of an RFI document, an RFP document is sent to the suppliers. It has been concluded that there is no one best way to select a supplier that would fit every situation as the selection is a multi-objective decision, and organizations use a variety of different approaches for completing the task. There are also several criteria, e.g., cost, quality, and delivery performance, to be considered in the selection, but the importance of each criterion varies from a case to another. Ultimately, the aim, however, is the same regardless of the used method or criteria: to define an order of preference to select the most suitable supplier.

When procuring goods or services and when selecting the supplier, it is advised to consider the whole lifecycle of the supplier relationship. The idea behind this recommendation is the total cost of ownership (TCO) thinking, where instead of considering merely the price of the purchase, the total costs of selecting and maintaining the relationship with the supplier should be evaluated. Managing the supplier relationships throughout the lifecycle is called supplier lifecycle

management (SLM), which Smith (2012) describes as "*an end-to-end approach to managing suppliers in a transparent, structured, and integrated manner*." A few SLM models were presented in the literature by Smith (2012), Ashok (2019), and Bhuvaneswaran (2019). These models were combined and shown in Figure 2.6. According to the figure, there are ten steps in SLM: identification, qualification, evaluation, selection, on-boarding, performance management, risk management, development, SRM, and off-boarding. By applying the SLM model, organizations can achieve benefits, such as cost reductions, risk reductions, and value gains.

2.5.2 Supplier Relationship Management

Even though SRM is not a new concept anymore, it still has no single definition, and it is often used as a synonym for other close concepts. The existing definitions used in the literature focus on describing what activities are included in SRM, or they concentrate solely on the development and management aspect or the communication and interaction aspect of SRM. In this thesis the comprehensive definition of Mettler & Rohner (2009) for SRM, is going to be used: *"SRM is a comprehensive approach to enhance cooperation, coordination, and communication between the company and its suppliers to continuously improve efficiency of collaboration and concurrently enhance quality, security, and innovation."*

There are several benefits associated with implementing SRM practices and supporting the efforts with a system. Even without a system, SRM is said to, e.g., improve the company's financial performance, result in cost savings, and perform processes more efficiently. Nevertheless, SRM is identified to be a good match for IT system enablement, because of three distinct reasons:

1. SRM is a complex process that would be easier to handle with IT (Wu & Shen, 2006).
2. The more suppliers there are, the more difficult it is to keep track of all of them without a system (Hardy, 2017).

3. The relationships with the suppliers are interactive, and they would benefit from having a system for support (Chepchumba Kosgei & Gitau, 2016).

SRM systems are studied to have both strategic and economic benefits. They free up time from the purchasing and procurement people to concentrate more on strategic tasks instead of routing work. They also, e.g., improve the efficiency and effectiveness of work, reduce risks, and enhance opportunities for innovation. A growing number of organizations have seen the potential on SRM and SRM systems, and they have started to implement both. Those organizations that choose to ignore this change will quickly become less competitive.

2.5.3 IT Procurement Process

As the market is filled with competing system alternatives, companies need to put an effort in selecting the most suitable system that fulfills their specific needs. To do this, the development of an IT procurement process model is fundamental. There are several IT procurement processes presented in the literature, but the most comprehensive one, with twelve steps, is by Wakeford (2012). This process was compared with the general procurement processes presented by van Weele (2010) and van der Valk & Rozemeijer (2009). By doing so, one key difference was evident: the model by Wakeford (2012) emphasized system selection, while the models by van Weele (2010) and van der Valk & Rozemeijer (2009) emphasized supplier selection. Consequently, these three models were together used for coming up with a preliminary IT procurement process model for the case company.

The suggested preliminary IT procurement process model begins with identifying the need for a new system. From the beginning, it is essential to understand the objectives and expected outcomes of the system acquisition. Also, the people who are going to be involved in the process – namely, the stakeholders – are decided.
The process then proceeds to the RE study of the system. System requirements are critical to be defined at the beginning of the procurement process as they specify

what kind of system should be acquired. The RE study is divided into three main activities and two supporting activities: requirements elicitation, requirements analysis, requirements validation, requirements documentation, and requirements management.

Beginning with the first main activity, in requirements elicitation, the requirements are discovered by consulting the stakeholders. Techniques from which to choose from include, e.g., interviews, workshops, and use cases. The second main activity, requirements analysis, is about revising the requirements for any conflicts, overlaps, and inconsistencies, which are resolved by prioritizing and grouping the requirements. The last main activity is requirements validation in which consistency and completeness of the requirements are validated by reviewing, refining, and agreeing on the requirements. The supporting activities, requirements documentation, and requirements management are in place to ensure communication of the requirements between the stakeholders and the IT-providers, and to manage information.

In addition to defining the system requirements, also the requirements for the IT-providers should be formulated. This step is missing from the IT procurement process model suggested by Wakeford (2012), even though supplier selection based on specified requirements is argued to be one of the most critical steps in procurement. Indeed, especially for IT procurement to be successful, the selection of a capable IT-provider is essential (Cao, Cao & Wang, 2012; Chen & Wang, 2009). The requirements and their relative importance will, however, widely vary case by case, but they often relate to criteria, such as cost, quality, and delivery performance. Additionally, when assessing the costs, it is advised to take an SLM approach and to consider the TCO instead of merely focusing on the upfront costs of procuring an IT system.

After gathering the needs and requirements for the system and the IT-provider, the procurement process advances to the selection phase. The first activity is to comprise

a longlist by, e.g., doing an Internet search, getting references from colleagues, or receiving direct contact from an IT-provider. Next, an RFI document is drafted based on the requirements.

After sending the document to the candidates to fill in and collecting the answers, the results are scored with a chosen method, for example, the weighted scoring method. There is no one best method to select a system and an IT-provider because the selection is a complex, multi-objective decision. However, some analytical method should be chosen for dealing with such conflicting and complex decisions to find the system and the IT-provider which meet the requirements (Cao, Cao & Wang, 2012; Chen & Wang, 2009). Analytical methods are suggested over the inherently subjective nature of human judgments that are not often realistic or even feasible (Chen & Wang, 2009). Based on the scoring, a shortlist is comprised of comparing the scores and eliminating the candidates that do not meet the requirements.

Lastly, the shortlisted candidates are evaluated in-depth through pitch/demonstration meetings and reference site visits to arrive at the final selection.

On the grounds of the literature review, the preliminary six-step model for the IT procurement process presented in Figure 2.9 is proposed to be followed in the empirical study.

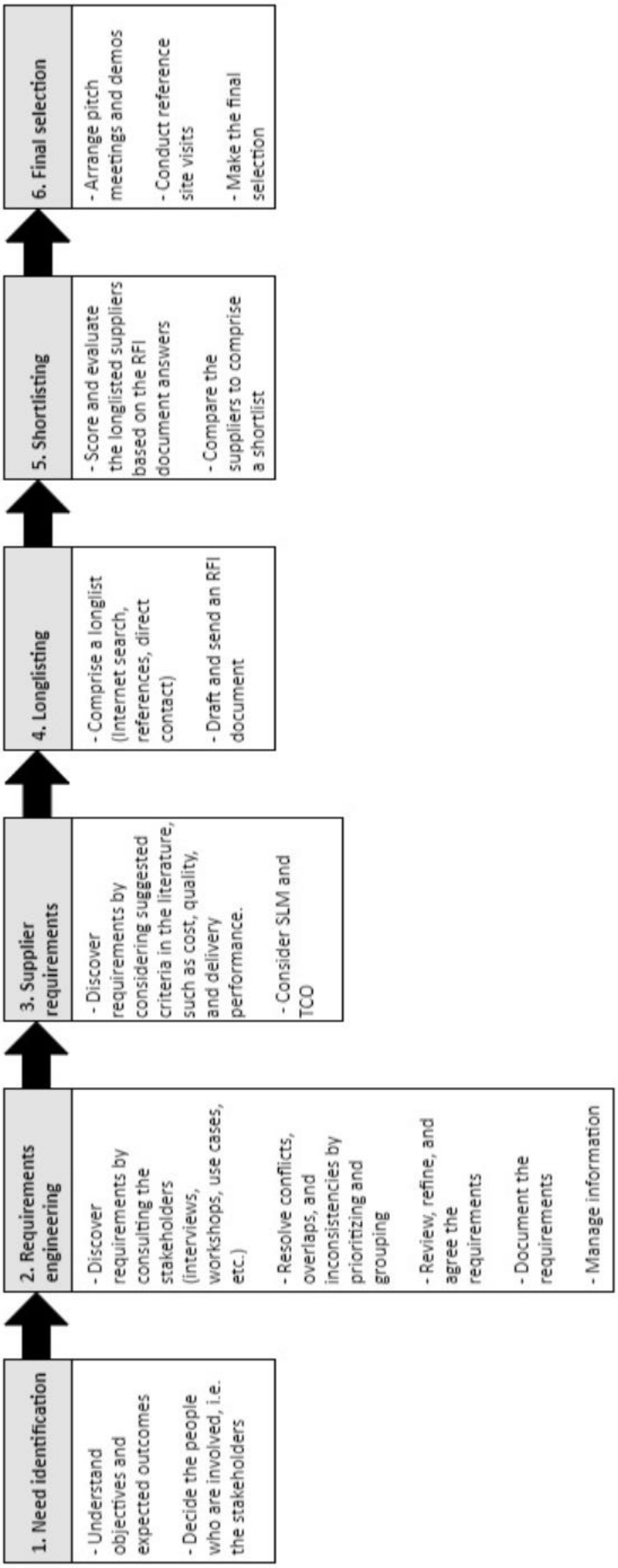

Figure 2.9 Preliminary IT procurement process model.

3 Research Methods

3.1 Research Philosophy

The choice of methodology and research methods underpin the analysis and interpretation of the data. Thus, it is needed to justify these choices by addressing the ontological and epistemological views that determine the choice of methodology. (Zalan & Lewis, 2004) Besides, the research topic, the objective of the study, the research problem and questions, and the theoretical frameworks affect the research and the choices made throughout the research process (Avison *et al*., 1999; Zalan & Lewis, 2004).

Understanding philosophical underpinnings, i.e., ontology and epistemology, is essential for choosing the appropriate research methods and design, but also for ensuring the quality of the research and for finding better explanations for the results (Hirsijärvi, Remes & Sajavaara, 2009). This involves considering what kind of evidence is required and how it should be gathered and interpreted, and how these choices will lead to the answers of the research problem and questions (Easterby-Smith, Thorpe & Jackson, 2012). The researcher should thus first understand the subject being studied and then reason what methods should be used for studying it (Hirsijärvi, Remes & Sajavaara, 2009).

Ontology explains how the researcher understands the subject being studied, which affects the choices of theory and concepts. That is, ontology is about the nature of reality and existence. (Hirsijärvi, Remes & Sajavaara, 2009) This thesis takes a relativistic approach to ontology, which argues that there exist many truths and the facts observed depend on the viewpoint of the observer. (Easterby-Smith, Thorpe & Jackson, 2012)

Epistemology describes how the researcher intends to get information about the subject being studied, which affects the choices made about conducting the study

(Hirsijärvi, Remes & Sajavaara, 2009). The researcher should thus evaluate what are the best ways of enquiring into the nature of the world. This thesis supports the social constructionism view of epistemology. This view reasons that reality is socially constructed and people give meaning to it. Specifically, social constructionism focuses on the ways people make sense of the world through sharing their experiences with others. (Easterby-Smith, Thorpe & Jackson, 2012)

Relativistic ontology and social constructionism epistemology fit well to the objective of this thesis. With these philosophical underpinnings, it is justified, e.g., that the researcher is part of what is being observed, rich data is gathered during the research process, stakeholder perspectives and human interests are in a central role, the whole complexity of the situation is addressed, generalization beyond the case example is enabled, and the outcome is theory generation (Easterby-Smith, Thorpe & Jackson, 2012).

3.2 Literature Review

The theoretical part of this thesis was covered in chapter 2. The chapter began by examining SRM, its definition, benefits, and SRM systems and their benefits. For this purpose, research articles regarding the subject were used. After this, IT procurement practices were considered. The sources for this were found from basic textbooks and research articles. The aim was to establish knowledge of what activities should be included in the IT procurement process model.

The process of the comprehensive literature review was carried out by first searching for a large number of potentially relevant material for the study. The primary source for information retrieval was Scopus, but also Aalto University Library services and Google Scholar were used for additional information. The literature review process and its results are presented in Table 3.1.

Table 3.1 Literature review process.

Keywords	Round 0	Round 1	Round 2	Round 3
"Supplier relationship management"	304	69	18	14
"Supplier relationship management" AND "System"	113	52	13	11
"Information technology" AND "Selection" AND "Procurement"	61	36	12	7
"Requirements engineering" AND "Information technology"	527	42	15	6
"Information technology" AND "Supplier" AND "Vendor"	134	30	22	13
"Supply chain management" AND "Definition" *Only title was considered instead of title, abstract and keywords (3178)	16	12	12	10
"Procurement process" *Only title was considered instead of title, abstract and keywords (3982)	227	16	9	8
"Supplier" AND "Lifecycle management"	173	6	4	4
Total	**1555**	**263**	**105**	**73**

Round 0 is the starting point. These 1555 documents were the original research papers that were found from Scopus by using the keywords. After this, there were three rounds to get to the final set of articles. During each round, the article in question was either qualified or disqualified. In the first round, the articles were evaluated cursorily, and the title and the abstract were read. In the second round, the conclusion of the article was read, and some key figures and tables were scrolled through. In the last round, the whole article was read, and as a result, 73 articles were used for the literature review. After the last round, the articles were divided into categories based on the keywords or topics they represented.

As mentioned, Scopus was not the only source of information. Additional research articles and information was found from the library, Google Scholar, and by examining the references of the research articles. In the table, round 0 value of 1005 initial articles represent the value given from the Scopus database. However, the

values in the subsequent rounds include the articles, textbooks, and other additional material from other sources that fit the used keyword.

The final set of research papers was analyzed in-depth to understand the research topics. Some articles did not end up containing a lot of critical information, after all, and they were only read once. On the other hand, some articles were found more valuable for the study and were therefore read and analyzed several times. When reading, relevant sections were highlighted to ease the finding of essential parts of each document later.

3.3 Empirical Study

3.3.1 Research Methods

A qualitative research method focuses on complex and holistic data representing real-life events and occurrences in their natural settings. Qualitative data has an emphasis on people; thus, it is well-suited for understanding people's perceptions and assumptions of the research subject from different viewpoints. To continue, a particular strength of the qualitative research method is its ability to explaining what goes on in an organization. (Amaratunga *et al*., 2002)

The research problem of this thesis is to develop a model for the IT procurement process. To do so, a holistic understanding of the benefits associated with SRM, the needs, and requirements for the new SRM system and the IT-provider, and the factors to consider in the final selection are required. Thus, a qualitative research approach was chosen as the primary research method. The method is more appropriate for this study compared to quantitative research since quantitative data is not enough for representing complex real-life issues involving humans (Runeson & Höst, 2009). However, to support the objectivity of the selection, a scoring method is used for evaluating alternative systems and IT-providers.

To gather data, a case study was selected as a research strategy, and the study was executed as an insider action research. According to Yin (2003), case studies investigate contemporary phenomenon within the real-life context, and they are tailor-made to discover and understand new processes. Thus, using a case study research strategy enables to understand the current situation and practices at the case company and how they could be developed. Case studies are holistic, allowing the phenomenon to be studied from a variety of viewpoints (Ghauri, 2004), and enabling to create a framework or a theory for the collection of evidence (Remenyi *et al*., 1998).

Insider action research is a particular case of action research. In this method, the researchers are a part of the organization and have a preunderstanding of being an actor in the processes being studied (Coghlan, 2001). This method was chosen because it allowed the author to be both a researcher and a practitioner. The insider action research method follows the same iterative research process as action research, which is described in detail in subsection 3.3.2. With an action research method, it is possible to address complex real-life problems (Avison *et al*., 1999). The research method can introduce changes in the processes being studied while generating theory (Baskerville, 1997; Susman & Evered, 1978).

The case study was divided into three phases: SRM, RE, and IT-provider and system selection. The existing SRM practices at the case company were compared against the ones introduced in the literature to assess what benefits could be gained from implementing SRM and supporting the efforts with a system. In the RE phase, qualitative data was acquired from unstructured initial interviews, semi-structured official interviews and workshops with the company employees, and email questionnaires that were sent to selected suppliers. Also, existing documentation regarding RE practices and previous RE studies made at the case company was used as a reference. In the IT-provider and system selection phase, the selection was based

on the evaluation and scoring of an RFI document, pitch/demonstration meetings, and reference interviews.

Case studies typically have a wide variety of data sources, such as interviews, questionnaires, and archives (Eisenhardt, 1989) – and this study was no different. The most widely used qualitative method for case studies is an interview, which was the primary source of data for the RE phase in this study. The reason for this was that interviews are highly efficient in gathering complex empirical data about human affairs from different perspectives (Eisenhardt & Graebner, 2007). Interviews are also particularly well-suited for exploratory and theory-building studies (Daniels & Cannice, 2004), thus giving an in-depth understanding of the needs and requirements for the system and the IT-provider, which have a critical effect on the success of the whole IT procurement process.

3.3.1.1 Data Acquisition & Analysis

In the SRM phase, the existing SRM practices at the case company were investigated based on the information found from the company's database. This information was then compared against the literature review findings to evaluate the potential benefits that could be gained from effective SRM practices supported by a system.

In the RE phase, existing literature concerning RE processes and practices were contrasted with the procedures and methods used at the case company. After this, five unstructured interviews and 21 semi-structured interviews were held face-to-face (F2F) or via Skype, and six email questionnaires were sent out to the suppliers. The respondents represented selected stakeholders of the project: procurement, purchasing, research and development (R&D), and suppliers worldwide. In addition, all together, three workshops were held for procurement, purchasing, and R&D functions.

The five unstructured initial interviews were held with an Indirect Group Procurement Manager and the Group Procurement Managers to get an introduction to the project and the daily work, as the procurement function is the main stakeholder group of the project. Based on this, the current state analysis was conducted. Additionally, a workshop was held with the procurement function to determine the vision and high-level objectives, and stakeholders of the project. After the initial interviews and the workshop, 21 semi-structured interviews were held with the selected procurement, purchasing, and R&D employees to determine the needs and requirements of the stakeholders. The semi-structured interviews had predetermined questions, but the order of the questions was, in some cases, modified to be more appropriate for the interviewee. Notes were taken during both the unstructured and semi-structured interviews, and the notes were transcribed for analysis. The list of respondents is presented in Table 3.2, and the interview questions are found in Appendix A. The respondents were kept anonymous to encourage openness. The needs and requirements for the suppliers were based on the literature findings regarding supplier criteria.

Table 3.2 Respondents.

Stakeholder	**Positions**	**Locations**	**Number of interviewees**
Procurement	Chief Procurement Officer (CPO) Group Procurement Managers (GPM) Indirect Group Procurement Manager	Finland	6
Purchasing	Purchase Managers (PM) Regional Purchase Manager Purchasers Warehouse Manager	Finland, Denmark, Germany, Poland, Malaysia, Russia	8
R&D	R&D Manager R&D Chemists Technical Service Specialist Project Manager IT Solution Specialist	Finland, Denmark, Germany	6

Stakeholder	Positions	Locations	Number of interviewees
Suppliers	Account Managers Key Account Manager Senior Business Manager OTC Finance Process Owner	Finland, the UK, Sweden	6

The interview questions were designed according to a commonly used sequence of questions: introduction, warm-up, main body of the interview, cool-off, and closure. (Robson, 2002). The interviews were structured using nondirective questions, and by avoiding leading or speculative questions. In the introduction, the SRM project was shortly presented to the interviewee. The actual interview began by asking the interviewees about their regular day in their position, current responsibilities and practices, and how they would describe SRM in their own words. After the warm-up questions, the main body of the interview was designed according to two themes: as-is and to-be situations and practices concerning the current and new SRM systems. The interview went further, asking about current practices when using the system, issues with the existing system, and satisfaction and thoughts about the present and new systems. Finally, a few cool-off and closure questions were asked to lighten the end of the interview.

The interviews took approximately an hour to one and a half hours. For the ones who had not used the current system, the interview took around thirty minutes, since many questions were about the current system. Depending on the expertise of using the current system, the precision of each interviewee's description and answer varied greatly. To continue, the language barrier in some cases was noticeable, making the answers shorter and not as detailed and vividly explained as others.

In addition to the interviews, workshops were held for the stakeholders from the case company. The objective of the workshops was to discuss in a group about the needs and requirements gathered from the employees representing a particular function,

and the priority of the requirements. Suppliers were considered by sending them an email questionnaire. The questionnaire was modified based on the interview questions. The questionnaire is found in Appendix B. The questionnaire was shorter, and in that sense, more straightforward than the interview. The questionnaire dealt with, among other things, SRM in general, common issues faced with systems and how to resolve them, and thoughts about the new system.

In the IT-provider and system selection phase, the selection was based on first creating a longlist of candidates based on an Internet search, references from colleagues, and direct contact from candidates. Also, the system used by some of the case company's suppliers and the current system used in the case company was included in the longlist. The longlist was then cut down to a shortlist based on scoring the answers of the RFI document filled in by the longlisted candidates. The scoring was done using a weighted scoring method.

The scoring was done to system requirements and supplier requirements. The system requirements were all closed-ended questions. The questions that had a positive answer were assigned a value of 1, and the questions having a negative response were assigned a value of 0. The must have requirements were given a weight of 2, the should have requirements had a weight of 1.5, and the could have requirements had a weight of 1. Each question belonged to a specific group, and an average for the group was calculated based on the individual scores. From the group average scores, a total average score was calculated for the candidates. Additionally, the number of fulfilled must have, should have, and could have requirements was also calculated and compared between the candidates.

Supplier requirements had both closed-ended and open-ended questions. When dealing with closed-ended questions, again, the positive answers were assigned the value of 1 and negative responses the value of 0. For the open-ended questions, an optimal answer was comprised. The scoring was done by comparing the IT-provider's

answer to the optimal answer. If the answer corresponded with the optimal answer, a value of 1 was assigned; if the answer did not correspond with the optimal answer or an answer was not provided, it was assigned a value of 0; if the answer was too vague, it was assigned the value of 0.5; and if the answer was better than the optimal answer, it was assigned a value of 2. After scoring, a total average score was calculated for the supplier requirements.

The shortlisted candidates were examined in-depth by arranging pitch/demonstration meetings and reference interviews. Scoring was done during the pitch/demonstration meetings based on the answers provided to a demonstration form (Appendix D) by the stakeholders participating in the demonstrations. The questions were designed to address subjective factors that have not been possible to evaluate before, such as usability, speed, and intuitiveness. Questions A-J were given points from on a scale of “Inadequate” (0) – “Acceptable” (1) – “Good” (2) – “Excellent” (3), and questions K-L were given points on a scale of “No” (0) to “Yes” (1). After the demonstrations, an average for each candidate was calculated based on the scores. The reference interviews were conducted via email or Skype as semi-structured interviews. The factors considered in the reference interviews concentrated on those supplier requirements that had not been addressed before, such as the relationship and communication with the IT-provider. Also, some of the supplier requirements that had been covered during the RFI step were validated through the interview. The reference interview questions are found in Appendix E.

All the methodologies used for data collection are gathered in Table 3.3, along with the details of formation, object, location, and documentation.

Table 3.3 Data collection details.

Methodology	Formation	Object	Location	Documentation
Archive	Analysis	SRM activities and framework, RE documents	Company database	Notes
Initial interview	Unstructured interview	Procurement	Company offices	Notes and transcript
Official interview	Semi-structured interview	Procurement, Purchasing, R&D	Company offices or Skype	Notes and transcript
Workshop	Group discussion	Procurement, Purchasing, R&D	Company offices	Notes
Questionnaire	Structured questionnaire	Suppliers	Email	Notes
Weighted scoring	Scoring, analysis	Longlisted candidates	Company offices	Notes
Pitch / Demonstration meeting	Scoring, analysis	Shortlisted candidates	Online	Notes
Reference interview	Semi-structured interview	Shortlisted candidates' references	Email or Skype	Notes and transcript

3.3.1.2 Validity & Reliability

Validity and reliability refer to the determination of how precise and believable the results of the research are. Validity can be divided into internal and external validity. Internal validity deals with cause-and-effect relationships, while external validity deals with generalizing the research findings. Reliability, on the other hand, is essentially repeatability. A reliable research study will produce the same results under the same conditions when another researcher follows the same procedures as described in the study. (Amaratunga *et al*., 2002)

When relying heavily on qualitative data, it is particularly important to validate the information gathered from various sources (Ghauri, 2004), since qualitative data by

its nature is broader and richer, but less precise than quantitative data (Runeson & Höst, 2009). There are several means to validate qualitative data, but perhaps the most suggested ones are triangulation and overall clear reporting of the research study to establish a chain of evidence, and thus ensuring both validity and reliability.

Triangulation refers to using multiple methods and data sources to ensure the validity and reliability of the research (Remenyi *et al*., 1998). By doing so, it is possible to produce more precise, holistic, and convincing findings and conclusions based on empirical research (Ghauri, 2004; Yin, 2003). Triangulation can be divided into data source triangulation, in which more than one data source is used, methodological triangulation where different data collection methods are combined, and theory triangulation where alternative viewpoints or theories are used (Runeson & Höst, 2009).

All types of triangulation were used in this thesis to corroborate the gathered data and findings. Numerous data collection methods were used as described above, and multiple data sources were used to get an understanding of the situation from alternative viewpoints. For example, interviewees represented eight different countries, and they had different positions and varied amount of experience at the case company. By choosing these interviewees, all perspectives were taken into consideration while getting a clear view of the overall situation and its complexity.

To establish a chain of evidence, detailed reporting is mandatory. It is crucial to prepare well to execute the research and to report essential matters in detail during the research process. The more precise the report is, the more valid the study and its findings are. (Järvenpää & Kosonen, 1997) With qualitative research, perhaps the most critical part of the study is data analysis. Data analysis needs to be interweaved with data collection, especially when dealing with a broad interview study, to allow an authentic understanding of the situation to develop alongside the growing volume of data. (Ghauri, 2004)

In addition to the means mentioned above of ensuring validity and reliability, regular meetings with the project team and steering group contributed to the evaluation of data and findings.

3.3.1.3 Limitations of the Research Methodology

There are certain limitations to the study that can affect the findings and conclusions. Firstly, case studies are prone to biases by the researcher, which can be difficult to rule out (Robson, 2002). However, the goal of reliability is to minimize these biases and errors in the study (Amaratunga *et al*., 2002). Secondly, the generalizability of the results can be challenging beyond the particular case context (Järvenpää & Kosonen, 1997). Also, concepts under the study are difficult to quantify, which forces to rely heavily on qualitative data, making it especially important to consider the validity and reliability of the study.

3.3.2 Research Process

For this research, a qualitative case study research strategy was chosen, and it was conducted as an insider action research process. As already stated, the insider action research method follows the same iterative process as action research. The process has five steps that are presented in Figure 3.1.

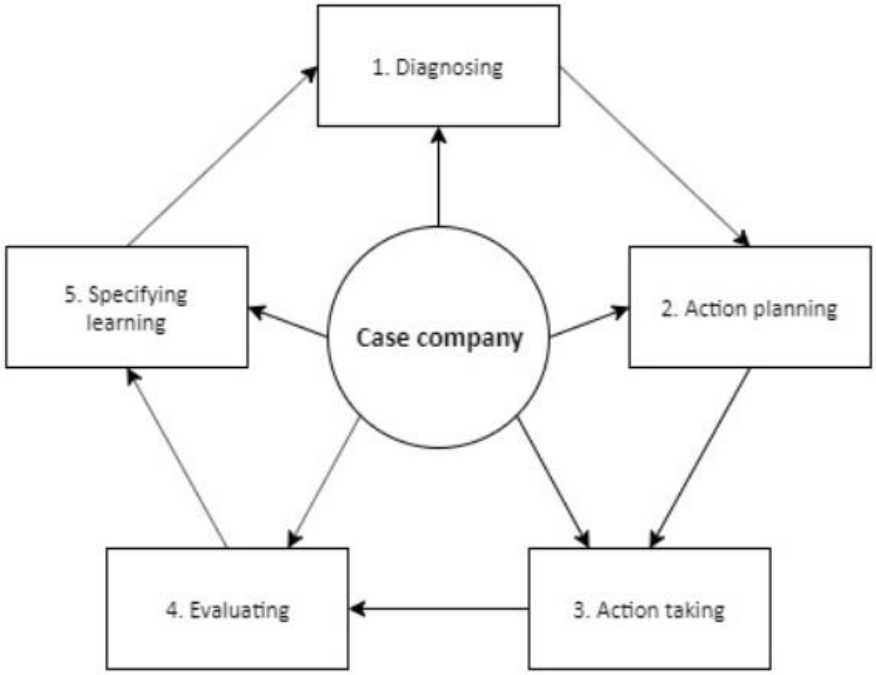

Figure 3.1 Iterative action research process (Susman & Evered, 1978).

The first step in the process is diagnosing. It corresponds to the identification of the research problem and questions that are the underlying reasons for the case company's desire for change. (Baskerville, 1997) The current state of the case company was analyzed, and it was identified that they need an effective SRM system, as the current system was not serving its purpose. In addition to studying the case company's perspective on the problem, also the academia's view was considered by conducting the literature review. This first step developed a theoretical understanding of the nature of the case company and its problem (Baskerville, 1997).

The second step is action planning. In this step, the researcher and the practitioners collaborate to specify the actions that should resolve the research problem and the questions. (Baskerville, 1997) In this step, the methods and the data collection techniques were decided. The research was designed to be conducted in three phases, according to the research questions: SRM, RE, and the IT-provider and system selection. First, SRM and its benefits were addressed. Next, the requirements for the system and the IT-provider were derived. Lastly, the IT-provider and system selection

were executed. These discovered actions were based on the literature and theoretical framework (Baskerville, 1997).

The third step is action taking, where the planned actions are implemented. The researcher and the practitioners collaborate to achieve the needed change in the case company. (Baskerville, 1997) In this phase, the project was conducted to answer the research problem and the questions. SRM was addressed by collecting information on the existing SRM practices at the case company. Then, the RE study was conducted to derive the needs and requirements for the system. Based on the literature, also supplier-related requirements were derived. Lastly, the IT-provider and system selection were implemented to arrive at the final decision on the system and the IT system supplier that satisfy the needs and requirements or the case company. By conducting the project, the research questions were answered, which provided the answer to the research problem.

When the actions were completed, the outcomes were evaluated in the fourth step. In evaluation, it is determined if the theoretical effects of the activities were realized to resolve the problem or not. (Baskerville, 1997) The assessment was done by comparing the results with the literature and by using common sense to determine whether the study was a success or if something needed to be improved in the future. Lastly, the sixth step is specifying learning (Baskerville, 1997). In this step, reflection was done to understand what was learned during the project. Also, it was estimated how the research contributes to the academic research and what managerial implications it has.

The action research process described consisted only of one iteration cycle. Additional iterations can be used to develop the proposed model further.

4 Empirical Study

4.1 Case Description

The case company is a Finnish chemical industry company that was founded in the late 1940s. The case company currently employs almost 2.000 people, and it has premises in over twenty countries in Europe, Asia, and Northern America. Customers range from the manufacturing industry and building professionals to consumers worldwide. The company offers chemicals for treating many surfaces, such as metal, paper, wood, concrete, plastic, asphalt, and building boards, and for many purposes, such as for the energy industry, machinery, and construction.

The case company, especially the procurement function, has longed for an effective SRM system for years. There is a framework for SRM, but to be effective, a system is seen to be essential. The current solution for managing supplier relationships is an expansion for an enterprise resource planning (ERP) system, but the extension does not satisfy the needs and requirements for an effective SRM system. Thus, there is a need to study the needs and requirements stakeholders have for the new system, and to select the most suitable system satisfying the needs and requirements.

Another objective of the case company is to come up with a model for the IT procurement process. Currently, there is not a systematic, corporate-wide approach to IT procurement available in the case company. IT investments have been made in the past, but the method has depended on the people researching a new system acquisition.

4.2 Supplier Relationship Management at the Case Company

This subsection helps in answering RQ1 (*What kind of benefits does an implementation of SRM practices via a system provide?*) while explaining what SRM means to the case company.

One way how the procurement and purchasing functions aim to contribute to the case company's strategic objective of continuous improvement is to have effective SRM practices in place. At the case company, SRM is defined as all interactions to manage the suppliers according to the organization's strategy and objectives and to systematically measure, develop, and engage the suppliers into deeper collaboration. For them, SRM comprises of three building blocks:

1. Supplier evaluation, which includes a supplier self-assessment, audits, and sustainability evaluation.
2. Supplier performance management (SPM), which is defined as the operational metrics, such as on-time-delivery (OTD), cost, and quality, that measure supplier performance.
3. Supplier innovation management (SIM), for which the processes and practices are yet to be defined.

Essentially, supplier evaluation is the process of investigating the capability levels of the suppliers. There is no official international standard for supplier evaluation, but at the case company, the assessment is based on PSK 8404 standard (PSK 8404, 2015). The evaluation process begins with the supplier filling-in a self-assessment form. After this, the evaluation takes place, and focus is given to five different areas: strategic direction, operational capability and quality, sustainability, economic performance, and R&D capabilities. Based on the results, areas for improvement are identified, and some of the suppliers will be audited for further investigation on-site.

In addition to the self-assessment and audits, sustainability is comprehensively evaluated with a tool designed for rating the suppliers' corporate social responsibility (CSR) performance. CSR is an essential factor for the case company, as they are committed to environmental responsibility and following environmental regulations, which are deeply embedded in the case company's operating principles and

development processes. Creating a sustainable company is even one of its strategic objectives, which entails CSR evaluation and SLM practices.

As the supplier relations progress, operational data is gathered for SPM. At the case company, this is seen as the essence of SRM. For them, it is essential that comprehensive data is collected throughout the relationship, and based on the data, action plans are decided to improve the performance of the supplier. Then, it is followed whether the action plans are fulfilled or not, and what were the results on the performance. Hence, in the case company, SRM is fundamentally about developing the suppliers' capabilities to become more competent suppliers.

As already stated, SIM processes and practices are one of the three SRM building blocks at the case company, but they are yet to be defined. In addition to SIM, several other SRM related development areas have been identified, including supplier segmentation. In the future, supplier segmentation is set to be the first step in SRM. The objective of supplier segmentation is to understand the positioning of the supplier, e.g., which suppliers are strategic and what SRM activities are associated with these suppliers. The aim is to have a written policy about what is the most suitable SRM approach for each supplier segment.

In addition to the above, it is worthy of addressing the organizational structure of the procurement and purchasing functions of the case company. The procurement and purchasing functions are divided into group-level procurement and local purchasing, and the whole organization is led by the CPO. The group-level procurement function is based in Finland, and it consists of the CPO, four GPMs and an Indirect GPM. Local purchasing functions are present in eleven countries in Scandinavia, Central Europe, Northern America, and Asia. The group-level procurement and local purchasing functions have distinct responsibilities. The group-level procurement is responsible, e.g., contracting and negotiating prices and terms with the major suppliers, category management, SRM practices, and risk management. The local purchasing is

responsible, e.g., contracting and negotiating prices and terms with the local suppliers or distributors, inventory management, and internal buying. According to the a stakeholder survey conducted at the case company in 2019, only 57 % of the stakeholders thought that the roles and responsibilities of procurement and purchasing are clear, and 40 % thought they are partly clear. Furthermore, the respondents gave a score of 2.9/5.0 for communication effectiveness.

4.3 IT Procurement Process at the Case Company

Next, the IT procurement process conducted at the case company will be elaborated. As stated, currently, the case company does not have a systematic, corporate-wide approach to IT procurement. However, the case company does have a model for RE (Figure 4.1) which was utilized in need identification and RE steps, as the model corresponded well with the literature findings.

This subsection provides answers to RQ2 (*How to conduct a requirements engineering study for an IT system?*) and to RQ3 (*How to select the most suitable IT-provider and a system from multiple available alternatives?*).

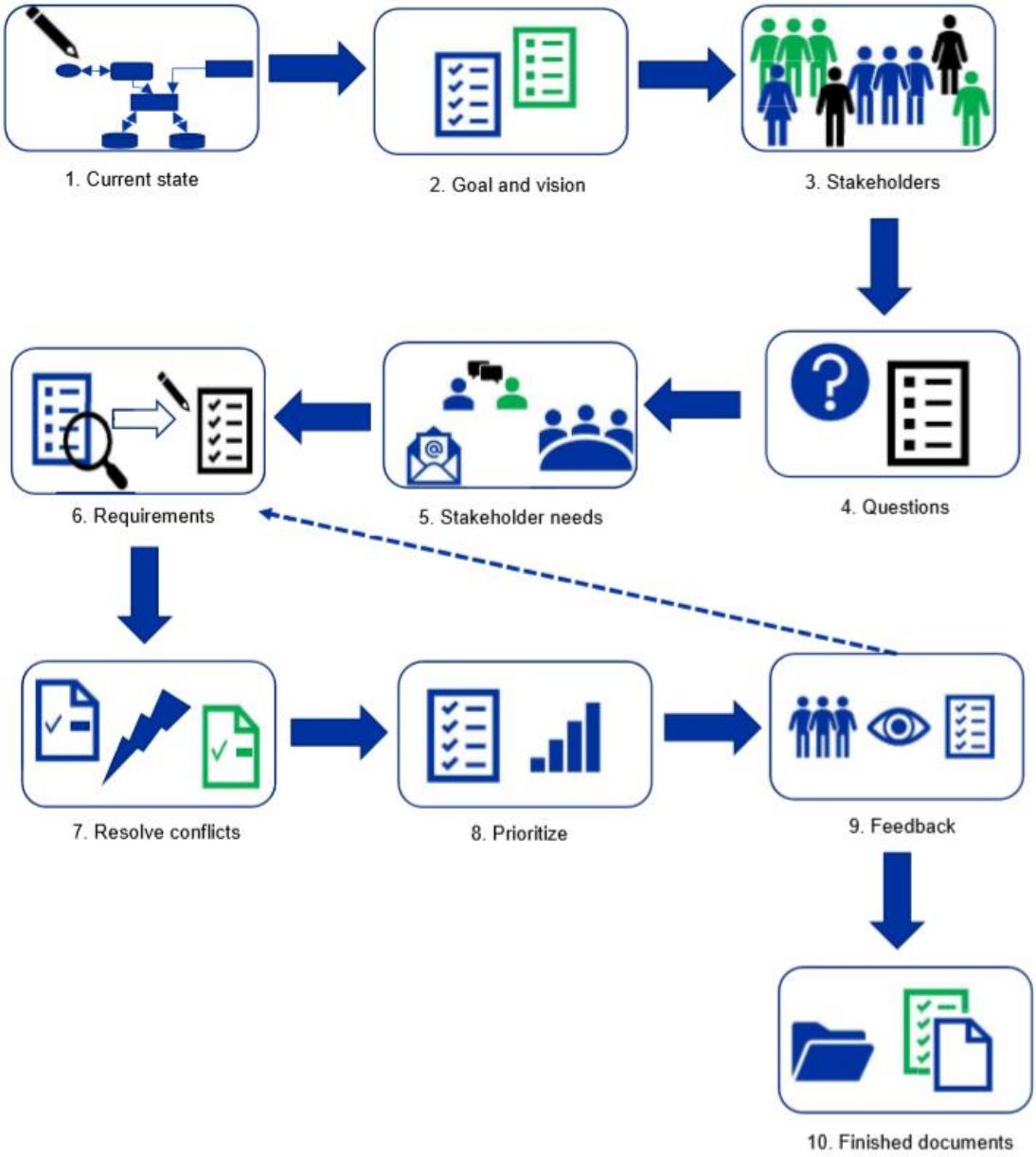

Figure 4.1 RE process at the case company.

4.3.1 Need Identification

The suggested preliminary IT procurement process begins with identifying the need for a new system, understanding the objectives and expected outcome from the system acquisition, and deciding the people involved in the process. In addition to these, the current state at the case company was examined as presented in Figure 4.1, based on which the need was identified.

4.3.1.1 Current State Analysis & Need Identification

The current state analysis was done by conducting five unstructured initial interviews with an Indirect GPM and the GPMs to get an introduction to their work and the SRM system project. The interviews were conducted with the group-level procurement function because they initiated the SRM system project, and the researcher worked for the function.

According to the current state analysis, the solution for managing supplier relationships is an expansion for an ERP system. It was acknowledged already a few years ago that the extension does not satisfy the needs and requirements of the case company. The extension is used as an archive for different documents about diverse information related to suppliers.

During the initial interviews, several high-level pain points were already recognized. The ones that were in common with the interviews included:

- Ineffective communication due to the difficulty of uploading or downloading documents to and from the system, which leads to the information and data not being up to date.
- The scarce information and data that was available in the system were not logically ordered, and it thus difficult to find what one was looking for.
- The employees did not want to use the system and some even avoided it because the system was experienced to be too difficult to use and irrelevant for the work.

The current state analysis revealed that there is a need to acquire a new SRM system that satisfies the needs and requirements of the case company.

4.3.1.2 Objectives

The vision and high-level objectives of the system were identified in a workshop held with the procurement function. At this point, stakeholders were not yet determined; thus, the workshop was held with the procurement employees, as they initiated the project. The vision for the system was to enable transparent communication and information between the case company and its suppliers in one place. Additionally, multiple high-level objectives for the system were identified, such as ease-of-use, fast, visual, and reliable.

4.3.1.3 Stakeholder Identification

The stakeholders were identified with the help of the procurement function in the same workshop where the high-level vision and objectives were discussed. Four groups of stakeholders were seen relevant for the RE study: the procurement, purchasing, and R&D employees, and suppliers. The number of participants from each function, location, and their roles was presented earlier in Table 3.2. The stakeholders were identified by defining the primary users of the new system.

Additionally, a steering group and a project team were set up. It was decided that the steering group would consist of three people: the researcher, the CPO, and one of the GPMs. The steering group met regularly during the project, and during the meetings, the researcher reported how the project was progressing and if some difficulties needed to be addressed. The CPO was the sponsor of the project and a GPM was the project owner, while the researcher worked as a project manager. The project team had representatives from all other stakeholder groups except for the suppliers. The team comprised of the researcher, three procurement employees, one purchasing employee, and one R&D employee. The project team gathered together two times during the RE study: 1) to evaluate the current state analysis, vision, and high-level objectives, and 2) to go through the reported needs and requirements.

4.3.2 Requirements Engineering

The second step in the procurement process is the RE study of the system, which proceeded according to Figure 4.1. In the literature, there are three main activities and two supporting activities in RE: requirements elicitation, requirements analysis, requirements validation, requirements documentation, and requirements management. The supporting activities, i.e., requirements documentation and management, were done concurrently with the three main activities.

4.3.2.1 Requirements Elicitation

In requirements elicitation, the needs and requirements for the system are discovered by consulting the stakeholders. In Figure 4.1, requirements elicitation represents steps *4. Questions*, *5. Stakeholder needs*, and *6. Requirements*.

The means for collecting stakeholder needs was decided to be F2F or Skype one-to-one interviews, function-specific workshops, and supplier survey. Also, seven use cases were comprised to elaborate on the requirements. However, the use cases were left out of this thesis due to confidentiality. The purpose of the interviews, workshops, and survey was described in subsection *3.3.1.1. Data Acquisition & Analysis*. The interview and survey questions can be found in Appendix A and B.

Altogether 32 high-level needs and 126 requirements were identified. The high-level needs include, for example, audits, claims, data analytics, instructions, reliability, sorting, and visuals. Some of the most mentioned functional and non-functional requirements discovered based on the interviews are presented in Tables 4.1 and 4.2. The percentages represent how many of each stakeholder group representatives and how many in total mentioned the requirement during the interviews. For example, when three out of six procurement employees mentioned the requirement, the percentage is 50 %. The red formatting is for 0 %-49 % and green format for 50 %-100

%. Due to confidentiality, the requirements in the tables are presented at high-level as opposed to in detail as they were introduced in the RFI document.

Table 4.1 Some of the most common functional requirements.

Functional Requirements					
	All	**Procurement**	**Purchasing**	**R&D**	**Suppliers**
Risk Management	20 %	50 %	29 %	0 %	0 %
Document Handling	32 %	50 %	43 %	17 %	17 %
Information Sharing	60 %	83 %	86 %	50 %	17 %
Claims Handling	40 %	67 %	71 %	17 %	0 %
Supplier Evaluation	28 %	67 %	43 %	0 %	0 %
Sustainability	16 %	33 %	29 %	0 %	0 %
Supplier Innovation	20 %	17 %	14 %	50 %	0 %
Memos	20 %	50 %	14 %	17 %	0 %
Search Function	24 %	50 %	14 %	33 %	0 %
Sorting Function	20 %	33 %	43 %	0 %	0 %
Notifications	28 %	67 %	29 %	17 %	0 %
Instructions	28 %	50 %	57 %	0 %	0 %
Data Analytics	24 %	17 %	71 %	0 %	0 %

Table 4.2 Some of the most common non-functional requirements.

Non-functional Requirements					
	All	**Procurement**	**Purchasing**	**R&D**	**Suppliers**
Reliable	24 %	67 %	29 %	0 %	0 %
Interoperability	84 %	100 %	100 %	100 %	33 %
Usability	76 %	100 %	86 %	100 %	17 %
Fast	44 %	67 %	43 %	50 %	17 %
Data & Information	48 %	83 %	86 %	0 %	17 %
Overviews	44 %	67 %	71 %	17 %	17 %
Visuals	28 %	33 %	57 %	0 %	17 %
Logical	24 %	33 %	43 %	17 %	0 %
Mobile	24 %	50 %	29 %	0 %	17 %

All the interviewees also emphasized the importance of aspects that were specifically central to their role — the following excerpts present examples of such occasions.

GPM A was responsible for the SRM activities in general. Throughout the interview she emphasized the importance of having an effective way of managing supplier relationships and evaluating and monitoring the suppliers' performance.

"*Currently, we have a form for supplier self-assessment that is sent to the supplier via email to fill in manually. When we receive the response, we have to calculate the scores manually according to the given answers. This process should be made easier and automated through the new SRM system.*"

- GPM A

"*Everything related to the suppliers should be found from the system for us to be able to manage supplier information and data, and to evaluate and monitor the performance development of the suppliers.*"

- GPM A

One of the responsibilities of GPM B was claims handling, which came through from his responses.

"*Currently, the claims are handled manually, and the overall process of handling claims is clumsy. The process should be more effectively managed through automation with the new SRM system.*"

- GPM B

GPM C was responsible for sustainability, which she emphasized throughout the interview.

"*The new SRM system should include a sustainability aspect through integration with EcoVadis to see our suppliers' sustainability scores and how they develop. There should also be information whether the suppliers have complied with our supplier Code of Conduct.*"

- GPM C

Communications and information sharing is one of the responsibility areas of GPM D. Effective communications and sharing information was something that was promoted by virtually every interviewee, but this aspect was especially evident from interviewing the GPM D.

"*Communication and sharing of information should be two-way, transparent, and effortless between all stakeholders.*"

- GPM D

As purchasing employees need price lists and data analytics in their work, these aspects were emphasized during their interviews.

"*Currently, we get the price lists from our suppliers, and we need to manually type them to the current SRM system. This process should be automated in the new system.*"

- Purchaser A

"*I have to manually type the price lists into our current system, which is something I would want to be automated.*"

- Purchaser B

"*The price list should be automatically uploaded to the new system instead of typing them manually.*"

- PM A

"*I would like to do less manual work and less analysis in Excel. I want to be able to do data analysis, for example, estimating seasonal, in the new system.*"

- Purchaser A

"*In the new system, I would like to have data analytics and data visualizations.*"

- Purchaser B

"*There should be data analytics and visualizations, for example, graphs and percentages.*"

- PM A

"*The new system should reduce the time of finding data from the system, combining the data, and doing data analysis.*"

- PM B

"*I would like to have data analytics in the new system to help me with data handling and the analysis. This would reduce the time I now use for making data analyses instead of analyzing the results.*"

- PM C

"*I would appreciate having automation for handling raw data. I would want to have data analytics that would enable me to sort data and make charts, statistics, and reports without as much manual work as today. I feel like this would benefit everybody as we all do the same analysis, and it would also reduce human error.*"

- Regional PM

Furthermore, several purchasing employees mentioned the need for forecasts to ease their work.

"*I would like to have forecasts about purchasing needs so that I can anticipate upcoming shifts or peaks.*"

- Purchaser A

"*I would like to have some help with forecasting future purchasing needs, so I could better anticipate them.*"

- Purchaser B

"*Forecasting raw material needs would make our work more proactive.*"

- PM A

During the interviews, it transpired that the R&D function was going to have a product data management (PDM) system that would be the primary system they would work with. Thus, the R&D employees' answers emphasized interoperability and what information they would want to have in the PDM system from the SRM system.

"*The new SRM system should be integrated with our PDM system. We need various information concerning suppliers and their products, for example, who should we do innovation projects with.*"

- IT Solution Specialist

"*We need to integrate SRM with PDM to get information about suppliers and their products.*"

- R&D Chemist A

"*It would be great if we could get, for example, safety reports from the suppliers through the SRM system. Currently, we have to ask these via email.*"

- R&D Chemist B

The majority of the suppliers informed to have barriers for using their customers' systems due to compliance reasons and security issues, which was evident from the survey answers.

"*For us, uploading information into a customer system is generally not favoured for compliance reasons. We can offer documents and information updates via an agreed channel, such as email but the customer should be the master and responsible for the data in the system.*"

- Supplier A

"*Generally, we have to decline to enter data on customer-specific databases and portals due to compliance and safety of ownership of the data and to handle information. As of now, we have to refuse to work with such a system.*"

- Supplier D

"*We do not see how we would benefit from using the SRM system in our relationship. We also do not use customer portals since we handle everything in our systems.*"

- Supplier F

4.3.2.2 Requirements Analysis

Requirements analysis is about revising the requirements for any conflicts, overlaps, or inconsistencies. These were resolved by prioritizing and grouping the requirements. In Figure 4.1, the requirements analysis represents steps *7. Resolve conflicts* and *8. Prioritize*.

The requirements were prioritized into three levels: must have (M), should have (S), and could have (C). The must have requirements are those that must be fulfilled, i.e., if the systems do not satisfy the requirement, the case company will not buy the system. Requirement with should have priority should be filled soon, preferably along with the first system update. The should have requirements do not, however, delay

the system implementation if they are lacking. The could have requirements would be nice to have, and they would bring value to the company and improve the performance, but they are not considered to be mandatory. Altogether, 60 must have requirements (48 % of total), 29 should have requirements (23 % of total), and 37 could have requirements (29 % of total) were derived.

As Wakeford (2012) described, functional requirements describe *what* the system should do, while the non-functional requirements describe *how* the system does these. Both kinds of requirements were identified based on the interviews, and the non-functional requirements were further grouped into sub-groups. All in all, 54 functional requirements (43 % of total) and 72 non-functional requirements (57 % of total) were derived. The sub-groups of non-functional requirements included, e.g., appearance, interoperability, speed, flexibility, and capacity. The percentages and numbers of each priority class and both types of requirements are gathered in Figure 4.2.

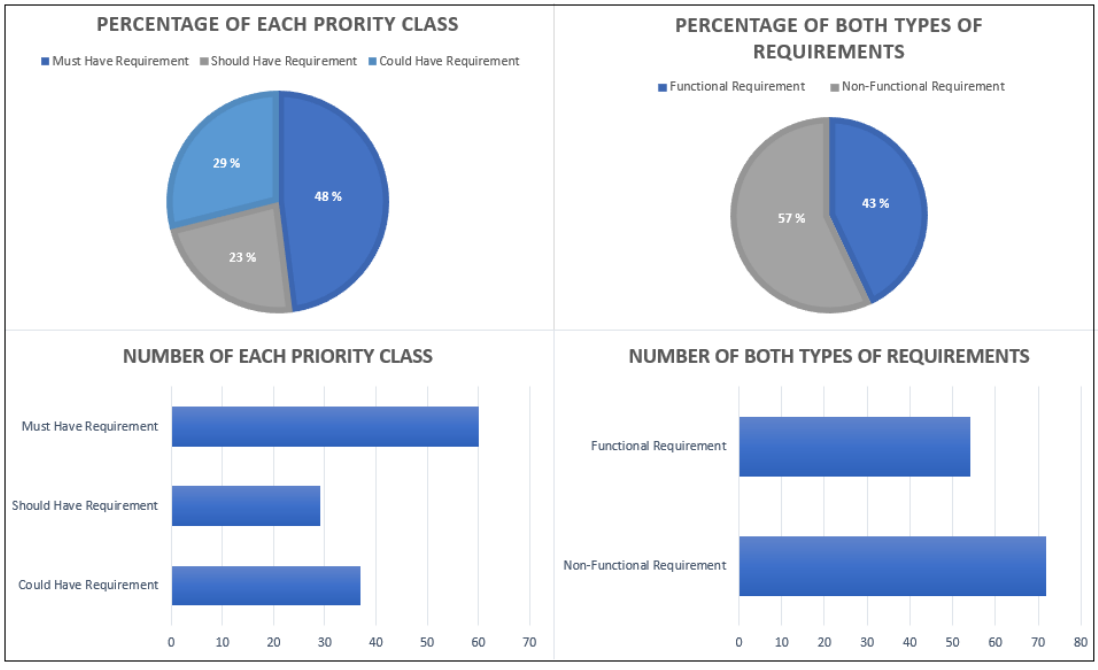

Figure 4.2 Percentages and numbers of each priority class and both types of requirements.

4.3.2.3 Requirements Validation

In requirements validation, the consistency and completeness of the requirements were validated by reviewing, refining, and agreeing the requirements. In Figure 4.1, requirements validation represents the ninth step *9. Feedback*.

The requirements were validated by holding a workshop with each function to go through the requirements gathered from their interviews. The requirements, prioritization, and grouping were then validated by the project team and steering group. After this, the final requirements document was approved, which functioned as the bases for the RFI document in terms of the system requirements.

4.3.3 Supplier Requirements

In addition to defining the system requirements, also the requirements for the suppliers were formulated. The chosen supplier requirements were based on the criteria presented in the literature.

In the RFI step, the supplier criteria were divided into costs, delivery performance, management capabilities and expertise, service and support, warranty and claims policy, flexibility, development capabilities, and environmental regulation compliance. The criteria were chosen based on whether it was believed that the IT-provider could answer the questions objectively. There were both closed-ended and open-ended questions, which were in later steps scored as described in subsection *3.3.1.1. Data Acquisition & Analysis*. The RFI questions regarding the supplier criteria are found in Appendix C.

Further, supplier requirements that were regarded as being subjective were evaluated in the final selection step through reference interviews. Also, some of the same supplier requirements covered in the RFI document were discussed during the

reference interview to validate the IT-provider's answers. The reference interviews will be discussed later in subsection *4.3.6 Final Selection*.

4.3.4 Longlisting

The selection phase began with comprising a longlist of candidates and their solutions. In this research the longlist was composed by doing an Internet search, getting references from colleagues and the case company's suppliers, and receiving direct contacts from IT-providers. Also, the current system was included in the longlist. The longlist of candidates and the source through which they were found are presented in Table 4.3. The candidates are kept anonymous and referred to by an assigned alphabet.

Table 4.3 Longlist of candidates.

Candidate	**Source**	**Candidate**	**Source**
Company A	Current system	Company K	Internet search
Company B	Direct contact	Company L	Internet search
Company C	Direct contact	Company M	Internet search
Company D	Direct contact	Company N	Internet search
Company E	Direct contact	Company O	Internet search
Company F	Direct contact	Company P	Internet search
Company G	Direct contact	Company Q	Internet search
Company H	Colleague	*Company R*	*Internet search*
Company I	Colleague	*Company S*	*Internet search*
Company J	Internet search	Company T	Supplier reference

In the beginning, there were 20 longlisted candidates. The candidates were contacted via email or a web form through the company website to inform that they are on the longlist and they will be sent an RFI document within a few weeks. Two candidates, Company R and Company S, did not respond to the contact requests despite multiple tries. Thus, they were left out of the final longlist, which is indicated with italics in

Table 4.3. The remaining 18 candidates were sent the RFI document which comprised of the requirements document and questions regarding the supplier criteria.

The candidates were given two weeks to answer the RFI. Companies C, E, and K asked additional clarifications for some of the requirements. The questions and answers were sent to each candidate to ensure fair and transparent selection. During the longlisting step, Companies B, F, G, J, K, O, P, Q, and T withdraw from the process due to one of the following reasons:

1. Not being able to fulfill the case company's requirements as the candidate and its capabilities were insufficient compared to the case company.
2. The candidate saw that the needed system and the case company were not significant enough to take on as a customer.
3. No clear reasoning was provided, or the candidate discontinued the dialogue.

Figure 4.3 presents how many candidates there were from each source at the beginning (20) and the end of longlisting (9).

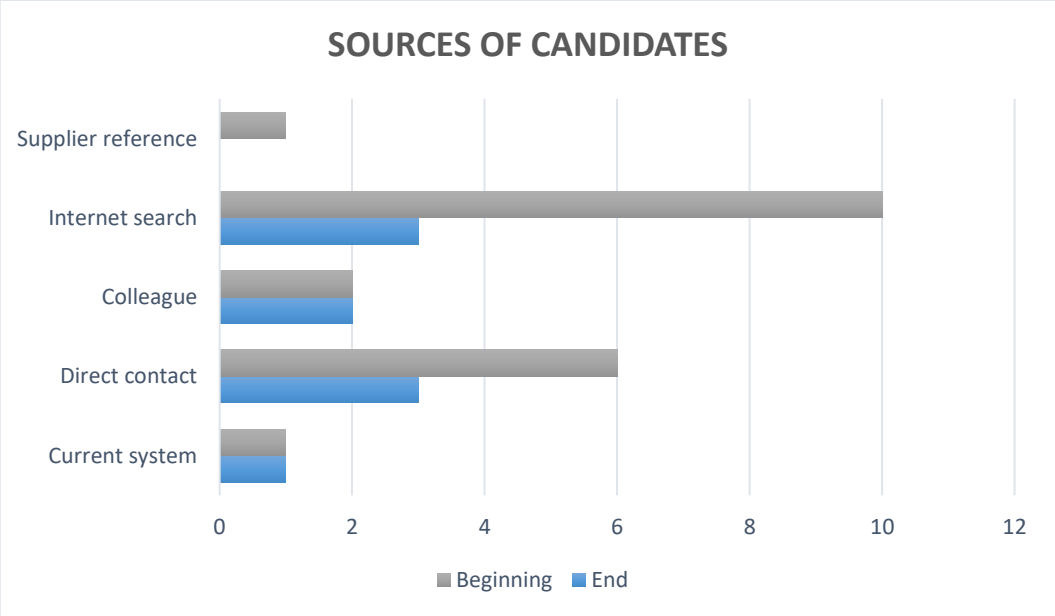

Figure 4.3 Number of candidates according to the source at the beginning and the end of longlisting.

The figure illustrates that the current system remained as a candidate after the longlisting responses. Also, the number of colleague references stayed at two. Direct contacts reduced by 50 % from six to three, Internet search results reduced by 70 % from ten to three, and supplier references reduced by 100 % from one to zero.

4.3.5 Shortlisting

After receiving the answers to the RFI from the longlisted candidates, the responses were scored with a weighted scoring method described in subsection *3.3.1.1. Data Acquisition & Analysis*. The resulting scores are presented in Table 4.4 in rank order.

Table 4.4 Shortlist scores.

Candidate	Functional Requirements	Non-functional Requirements #1	Non-functional Requirements #2	All Requirements	All Requirements #1	All Requirements #2	Supplier Requirements	Ranking
E	19,4	24,1	2,6	43,6	21,8	11,0	0,88	1
A	19,1	23,4	2,6	42,6	21,3	10,8	0,88	2
D	17,1	21,4	2,4	38,6	19,3	9,7	1,45	3
M	17,7	20,9	2,3	38,6	19,3	10,0	0,58	4
L	17,8	19,9	2,3	37,7	18,8	10,0	0,73	5
H	15,4	22,1	2,4	37,6	18,8	8,9	1,15	6
C	16,2	21,2	2,4	37,4	18,7	9,3	0,79	7
I	12,6	20,1	2,2	32,7	16,3	7,4	1,01	8
N	12,8	10,9	1,3	23,7	11,8	7,1	0,64	9

Column “Non-functional Requirements #1” scores were calculated without taking into account the different groups of non-functional requirements, such as interoperability and speed. The column “Non-functional Requirements #2” scores were calculated based on the weighted averages of each group. Columns “All Requirements #1” and “All Requirements #2” were calculated based on the score of functional requirements and value on “Non-functional Requirements #1” and “Non-functional Requirements #2” correspondingly. The column “All Requirements” was calculated without taking into account the separation to functional and non-functional requirements. The green color indicates the top four scores, the red color indicates the bottom three scores, and the yellow color shows the scores in between.

Based on the scoring, a shortlist of candidates was decided with the steering group. It was agreed that the top three would make it to the shortlist, i.e., candidates E, A,

and D. Candidate E scored the highest on all of the aspects, candidate A had the second-highest scores or matching scores with candidate E, and candidate D had the third-highest overall scores even though it did not have the third-highest scores throughout the scoring. Candidates E and D were included in the longlist based on their direct contact. Candidate A is the current SRM system provider at the case company, but they were offering a different, more suitable solution for SRM compared to what was currently being used.

4.3.6 Final Selection

The shortlisted candidates A, D, and E were then evaluated in-depth through pitch/demonstration meetings and reference interviews to arrive at the final selection. The demonstrations were scored with an average scoring method described in subsection *3.3.1.1. Data Acquisition & Analysis*. The resulting scores are presented in the following figures (see Figures 4.4-4.7).

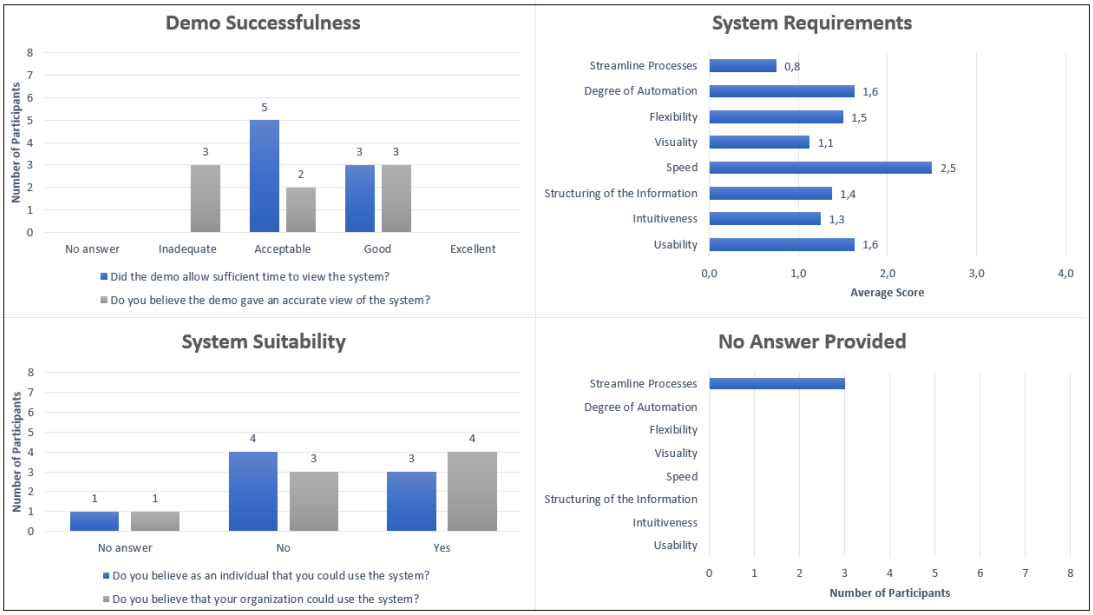

Figure 4.4 Candidate A demonstration scores.

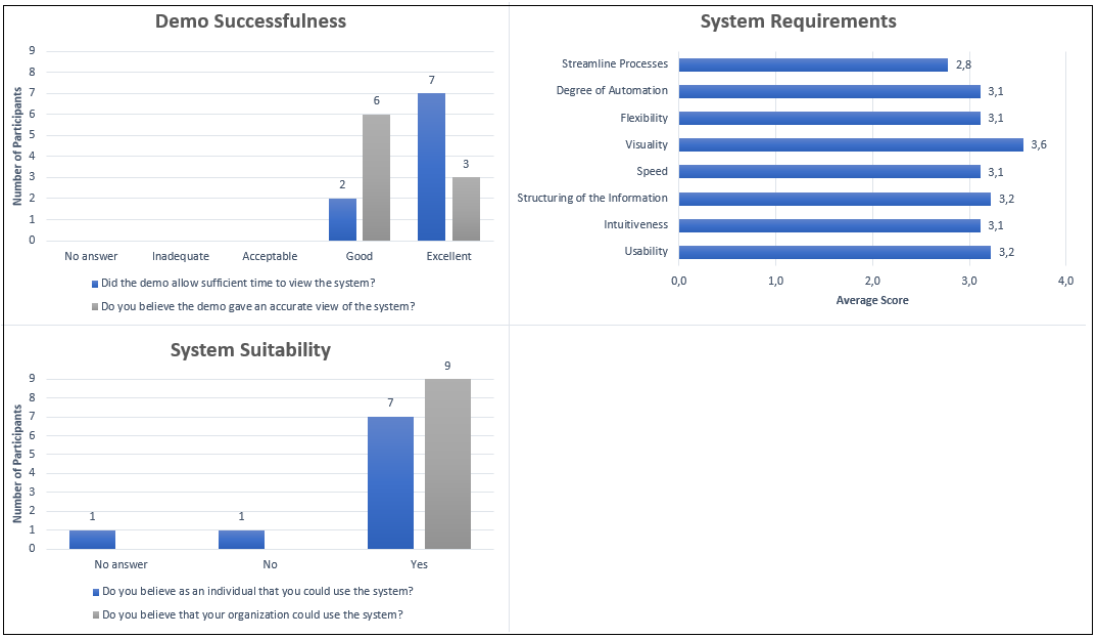

Figure 4.5 Candidate D demonstration scores.

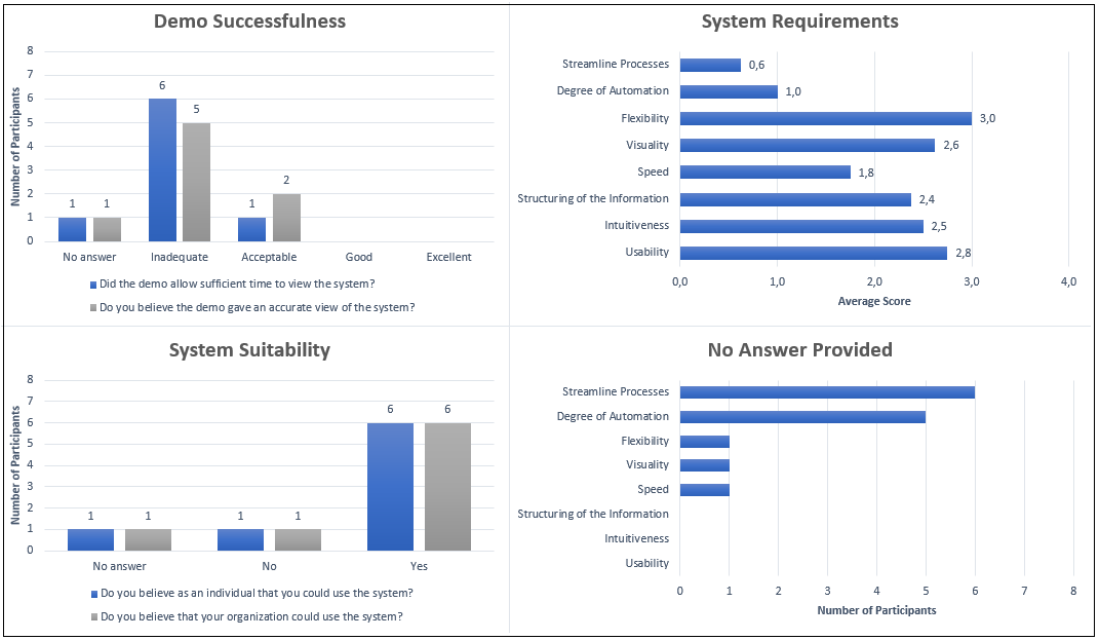

Figure 4.6 Candidate E demonstration scores.

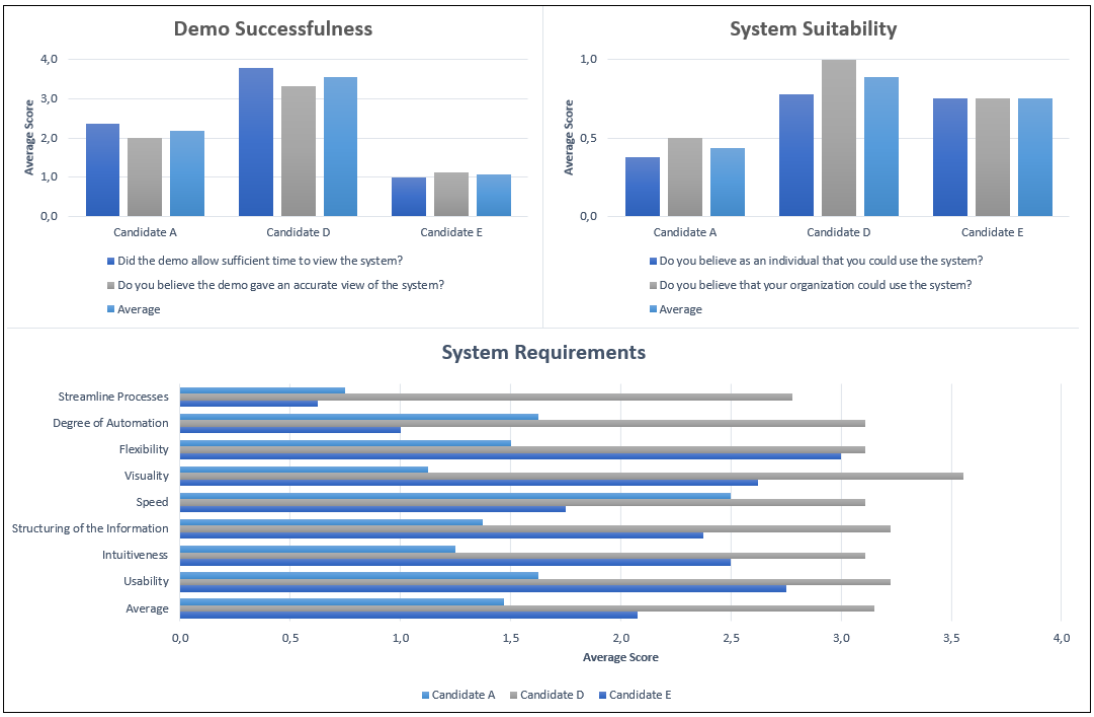

Figure 4.7 Comparison of the three candidate's demonstration scores.

"Demo Successfulness" scores were derived based on the answers to questions A and B on the demonstration form (see Appendix D), "System Requirements" scores were calculated based on the answers to questions C-J, and "System Suitability" scores were derived based on the responses to questions K and L. Additionally, candidate A and E have a chart that indicates how many of the participants did not provide an answer relating to the system requirements. The scores presented in Figure 4.7 are also collected in Table 4.5 to highlight the highest (green) and the lowest (red) scores. From the scores, it can be concluded that candidate D excelled in all of the aspects.

Table 4.5 Candidates' demonstration scores.

Summary			
	Candidate A	**Candidate D**	**Candidate E**
Did the demo allow sufficient time to view the system?	2,4	3,8	1,0
Do you believe the demo gave an accurate view of the system?	2,0	3,3	1,1
Average	2,2	3,6	1,1
	Candidate A	**Candidate D**	**Candidate E**
Usability	1,6	3,2	2,8
Intuitiveness	1,3	3,1	2,5
Structuring of the Information	1,4	3,2	2,4
Speed	2,5	3,1	1,8
Visuality	1,1	3,6	2,6
Flexibility	1,5	3,1	3,0
Degree of Automation	1,6	3,1	1,0
Streamline Processes	0,8	2,8	0,6
Average	1,5	3,2	2,1
	Candidate A	**Candidate D**	**Candidate E**
Do you believe as an individual that you could use the system?	0,4	0,8	0,8
Do you believe that your organization could use the system?	0,5	1,0	0,8
Average	0,4	0,9	0,8
SUM	17,0	34,1	20,3

The participant lists are shown in Table 4.6. The number on the brackets indicate the number of participants in the corresponding demonstration. What is notable from the participant lists is that the researcher also scored the demonstrations, and many of the participants attended all the demonstrations. The stakeholders taking part in the demonstrations were all from Finland, and they represented procurement and purchasing functions.

Table 4.6 Participant lists.

	Candidate A (8)	**Candidate D (9)**	**Candidate E (8)**
Participants	GPM A GPM B GPM C GPM D Indirect GPM PM A Purchaser A Researcher	GPM A GPM B GPM C GPM D Indirect GPM PM A Purchaser A Purchase Assistant Researcher	GPM A GPM B GPM C Indirect GPM PM A Purchaser A Purchaser B Researcher

Every shortlisted candidate was asked to provide two references that were using the candidate's SRM system. The references were advised to represent a company from the same industry as the case company or a company with a considerable number of different suppliers. The references were asked about the subjective system and supplier requirements, as well as SRM and SRM system related benefits that they had experienced. The interviews were not scored, instead, they were used to validate the perception of the system and the IT-provider, and to understand what SRM benefits could be realized by using a system.

Candidate A was unable to deliver a single reference, while candidate D delivered two and candidate E delivered one. Reference D1 was a wholesale trade company selling industrial machinery and machine components, from which the respondent was a Strategic Purchaser. Reference D2 was a large installation and building company, from which the respondent was a Procurement Director. Candidate E could only provide one reference that was a cloud-based software company. Reference E was in fact partnering with candidate E in building the SRM solution they were offering, but they also used the solution themselves for SRM activities. The respondent was a Senior Director of Global Procurement and Supply Chain.

The respondents gave overall positive comments regarding the systems and the providers. What was more interesting were the responses regarding SRM and SRM system benefits, which are presented in Table 4.7. and 4.8.

Table 4.7 Realized SRM benefits according to the references.

Benefit	Reference D1	Reference D2	Reference E
Cost savings	X		X
Improved financial performance			
Reduced risks	X		X
Reliable supply	X		
Innovations	X		
Reduced working capital	X		
Prevent reputation damage	X	X	X
Shorten time-to-market	X		
Improved product quality	X		
More efficient and streamlined processes	X	X	X
Better contracts and deals	X	X	X
Better responsiveness to customer needs	X		
Competitive advantage	X		X

Table 4.8 Realized SRM system benefits according to the references.

Benefit	Reference D1	Reference D2	Reference E
Coordinates and automates communication	X	X	X
All supplier information in one centralized place	X	X	X
On-going monitoring of the suppliers and their performance	X		X
Automates daily purchasing and procurement activities	X	X	X
Mitigates risk	X	X	X
Increases transparency	X	X	X
Accurate and timely information	X	X	X

4.4 Lessons Learned

4.4.1 RQ1 – Supplier Relationship Management

The first RQ asked "*What kind of benefits does an implementation of SRM practices via a system provide?*". This question was answered through investigating the current SRM practices implemented at the case company and contrasting them to the literature findings regarding SRM definitions and benefits, and SRM systems and their benefits. Also, the reference interviews conducted during the final selection step were used. Understanding SRM practices and what benefits having a system to support these practices offer provided motivation for the whole case and gave a better understanding of what might be wanted from the new system.

First, I decided to investigate the definition of SRM at the case company, as I felt that this would provide me some knowledge into what aspects they are looking for in the new system. The investigation gave me insight into their definition, which was quite well in line with the one by Mettler & Rohner (2009). Additionally, at the case company, they had defined three building blocks for SRM, which essentially described three key activities for them regarding SRM practices. The definition and the building blocks of SRM were something that I considered when assessing what often-cited benefits an SRM system might provide specifically to the case company.

The reference interviews proved to be a convenient way to understand what SRM benefits could be realized by using a system. However, there was some variety to the answers, and some references explained their responses, which made them more credible. Although, some often-cited SRM benefits are direct and some are indirect, making them more challenging to trace back to SRM efforts.

What was an interesting factor, in this case, was how fragmented the procurement and purchasing organizations are. The functions are scattered around eleven countries across the continents, and they are divided into global-level procurement

and local purchasing, which have their responsibilities. However, there is a distinct confusion among the stakeholders; thus, even among the procurement and purchasing employees, what the responsibilities are. Also, internal communication was seen to be an issue. As one of the often-cited benefits of having an SRM system was coordinating and automating communication, this communication issue could be at least partly resolved by using a system for SRM activities.

4.4.2 RQ2 – System & Supplier Requirements

The second RQ was "*How to conduct a requirements engineering study for an IT system?*". This question was answered by understanding the RE practices suggested in the literature and then coming up with a preliminary IT procurement process model in which the second step was RE. This process was then put to the test while contrasting the model to the RE process used at the case company.

At the time when this research was conducted, the RE process used at the case company was only a year-old model that was comprised based on literature. Hence, it was no surprise that the model fitted well with the literature findings. There were only some minor differences, such as that the need identification was included in the RE process. Also, more emphasis on the current state analysis and defining goals and vision was given. Something that I learned was that it might be a good idea to first identify the stakeholders, and then conduct the current state analysis and define the goals and vision. This way all the stakeholders would be included in the project from the start.

Something that was lacking from both models was the team or group aspect, which could be something to add to the preliminary IT procurement process model. At the beginning of the project, a steering group and a project team were gathered. When gathering the teams or groups, identifying the stakeholders before is essential. Also, the responsibilities of these teams or groups should be defined before assigning

people to the teams or groups, as it might affect the composition of people from different roles and levels.

In this project, the geographical location of the stakeholders presented some difficulties. The geographical location was one of the factors that affected the decision on who to include in the steering group and project team as well as the demonstrations in the later steps of the process. It is noticeable that especially the group-level procurement and local purchasing in Finland were the most heavily involved in the research. Also, during the study, it became clear that R&D was not that relevant stakeholder after all, as the R&D employees would not use the new SRM system. The primary system that the R&D department is going to take into use in 2020 is PDM, which will fetch relevant data from the SRM system for the R&D employees to use. Consequently, the R&D employees will not use the SRM system directly.

Regarding the RE study, it was evident that people tend to emphasize the matters that are the most important to them, which was an interesting finding. Something that was also interesting was that people often found it difficult to think what the new system could be like and what functions it should have. This showed in the answers in a way that respondents often took ideas from other systems they liked or they concentrated on the shortcomings of the current system. This ultimately affected the non-functional requirements, which were quite generic, such as keeping data up to date, having a logical structuring of information, being fast, and being user-friendly.

Another learning regarding RE practices was about requirements validation. Requirements validation is not a single step in a linear RE process. Instead, requirements validation happens iteratively throughout the RE process. Requirements validation is not only about agreeing requirements, it is also about

reviewing and refining them, which was done after every interview, workshop, and meeting.

4.4.3 RQ3 – IT-Provider & System Selection

The third RQ asked, "*How to select the most suitable IT-provider and a system from multiple available alternatives?*". This question was answered by drawing ideas from the literature relating to procurement and IT procurement practices, and supplier selection and SLM, to come up with a model for selecting the most suitable IT-provider and a system. Selecting the IT-provider and system was then put to the test according to the preliminary IT procurement process model.

The IT-provider and system selection started from longlisting. The majority of the longlisted candidates were found through an Internet search or a direct contact of the IT-provider. However, it was evident that even though direct contact was made, it did not guarantee a good fit with the case company's requirements. Also, the company size of the candidate ended up being a significant factor in whether the candidate answered the RFI or not. The fit between the company sizes and whether the IT-provider perceives the potential customer to be a desirable customer affects the outcome. Thus, it might be a good practice to look into the IT-provider's size in terms of revenue, strategy, and existing customers to save resources in the longlisting step.

Something to also consider while comprising the longlist is the current system and the overall number of candidates on the longlist. The current system is useful to include on the longlist at least as a benchmark. Besides, as in this case, longlisting the current system can give the current IT-provider a chance to understand better what is requested from the system and if they can provide it. The number of longlisted candidates started from 20 but only nine answered the RFI. Consequently, it is good to have a buffer instead of longlisting too few candidates and to end up with no candidates to shortlist.

When comprising an RFI document, both the system requirements and the supplier requirements should be taken into account. However, only the requirements that are objective can be asked, as it is not reliable to answer whether the IT-provider thinks their system is user-friendly or if they communicate well with their customers.

The next step in the process was shortlisting. It is a good practice to think about the RFI scoring even before sending out the RFI to the candidates. It should be decided that what kind of scoring method is used if some weights need to be assigned to specific requirements, and what would be ideal answers to open-ended questions so that they can be scored too. With scoring, the idea is basically to be able to effectively and reliably compare the candidates with each other. All in all, objectivity and fairness are the key to selecting an IT-provider and a system.

The last step in the process was the final selection, including pitch/demonstration meetings and reference interviews. From the demonstrations, it was evident that excellent RFI scores do not guarantee an excellent demonstration performance. During the demonstrations, participants were evaluating subjective requirements, such as the usability of the system. Furthermore, the participants were concurrently assessing the overall performance of the candidate and what their perception of them was after the demonstration, even though that was not an aspect of the demonstration form.

References proved to be challenging to get as the companies wanted to safeguard their customers, and they had to investigate who would be willing to answer the interview questions. The result of the references was as expected: all answers were positive. Consequently, it is questionable whether it is a good practice to ask for references when the candidate is going to give a reference where the system works perfectly.

5 Discussion & Analysis

5.1 RQ1 – Supplier Relationship Management

RQ1: *What kind of benefits does an implementation of SRM practices via a system provide?*

From the literature review, it was evident that there is no universally agreed definition for SRM. Some definitions relied on describing what activities can be included in SRM, while others focused on development and management aspects, yet some emphasized communication and interaction. As a result, based on the literature, I decided to go with the most comprehensive definition of SRM by Mettler & Rohner (2009): *"SRM is a comprehensive approach to enhance cooperation, coordination, and communication between the company and its suppliers to continuously improve efficiency of collaboration and concurrently enhance quality, security, and innovation."* This definition ended up being quite well aligned with the one that is used at the case company, as they describe SRM being all interactions to manage the suppliers according to the organization's strategy and objectives and to systematically measure, develop, and engage the suppliers into deeper collaboration. Additionally, however, they have divided SRM into three building blocks or activities, corresponding to some sources in the literature (e.g., Park *et al.*, 2010).

When assessing what often-cited SRM benefits the system could provide to the case company, I aimed to consider the case company's definition and the building blocks of SRM. What also helped in answering RQ1 was part of the reference interviews conducted during the final selection step. The realized SRM and SRM system benefits were presented in Table 4.7 and 4.8. When giving a response, the respondents also had the option of "*I prefer not to answer*." This option was used extensively by reference D2.

From the responses, it can be concluded that it is clearer to see SRM system benefits instead of tracing benefits back to SRM practices. Also, there is a significant difference in the responses of the respondents. Reference D1 reported to experience all but one SRM benefit, while reference E reported experiencing half of the SRM benefits, and reference D2 only three out of thirteen. With SRM system benefits, all of the respondents said to experience all of them or at least the vast majority of them.

What the case company needs from an SRM system according to their definition and building blocks, is to measure and develop the suppliers' performance through evaluations and to manage supplier innovations. Reference D1 and E reported to experience the benefit of on-going monitoring of the suppliers and their performance, and reference D1 also said to experience the benefit of innovations. Hence, these two benefits might be possible to achieve also at the case company. Also, the seven often-cited SRM system benefits were all mentioned during the interviews conducted during the RE step, and it seems credible to achieve these benefits according to the reference responses. Especially coordinating and automating communication and having all supplier information in one centralized place is a significant benefit for the case company that could solve at least a part of the communicational issue that the procurement and purchasing functions have.

The benefits that received the least responses were improved financial performance, reduced working capital, innovations, improved product quality, better responsiveness to customer needs, and shorten time-to-market. What seems to be the common factor is that the first two deal with a company's financials, and the last three relate to customers rather than the suppliers. However, regarding a company's financials, cost savings received two responses from references D1 and E instead of not receiving any or just one answer. To continue, to break the pattern, innovations do not fit the categories of company financials or customers, but it still got only one response from reference D1. Thus, it seems that it is plausible to achieve innovations benefits through SRM at the case company, but not inevitable. Also, it appears that

indirect benefits relating to company financials and customers rather than suppliers are difficult to trach back to SRM efforts.

To summarize, I believe that the case company can benefit the most in terms of measuring and developing their suppliers' performance, coordinating and automating communication, and having all supplier information readily accessible in one place. Also, the system would be able to increase the efficiency of work and transparency of communication. Furthermore, it is plausible for the case company to strive for supplier innovations, but not definite.

5.2 RQ2 – System & Supplier Requirements

RQ2: *How to conduct a requirements engineering study for an IT system?*

The RE process used at the case company fitted well with the literature findings (e.g., Kotonya & Sommerville, 2002; Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004), and thus it was directly usable for the RE phase. However, the preliminary model could be altered regarding the first step of the process, i.e., need identification. First, there could be a current state analysis that motivates the need for the new system, and then the stakeholders should be identified. After this, the goals and vision for the new system should be discussed with the stakeholders, and the steering group and project team and their responsibilities should be decided. The second step of the model, i.e., requirements engineering, does not need any alterations, but it could be emphasized that requirements validation is an iterative process. Also, it could be emphasized that documenting requirements and managing information takes place concurrently during the RE study. The findings are gathered in Table 5.3.

Table 5.1 Process comparison.

Need identification and RE in the literature	**RE process at the case company**	**Notes**
Need identification (Wakeford, 2012)	1. Current state 2. Goal and vision 3. Stakeholders	1. Current state analysis 2. Stakeholder identification 3. Determine the goals and vision 4. Form teams and decide the responsibilities
Requirements elicitation	4. Questions 5. Stakeholder needs 6. Requirements	-
Requirements analysis	7. Resolve conflicts 8. Prioritize	Participation of the teams.
Requirements validation	9. Feedback	Iteratively throughout the process with the participation of the teams.
Requirements documentation	-	Concurrently throughout the process.
Requirements management	-	Concurrently throughout the process.

The results of the RE study, i.e., the system requirements derived based on the interviews, workshops, and survey, were divided into functional and non-functional requirements. When analyzing the functional requirements, the requirements of the stakeholders were similar in terms of the importance of information sharing (60 %), claims handling (40 %), and document handling (32 %). The other functional requirements were between 16 % and 28 %; thus, there were no significant similarities across the functional requirements among all the stakeholders. Instead, it was evident that the respondents tended to emphasize the matters that are the most important to them and their work.

What was interesting is that the case company's definition of SRM had relatively low overall importance: supplier evaluation (28 %), supplier innovation (20 %), and sustainability (16 %). Thus, instead of emphasizing SRM activities and development and management aspects according to the case company's SRM definition, the respondents highlighted the communication and interaction aspect. This finding was interesting, as the case company has a definition of SRM that focuses on development and management aspects, and they also have defined three building blocks or activities for SRM. What the definition of SRM at the case company does not underline is precisely the communication and interaction aspect, which in turn was the only SRM aspect highlighted by the respondents. The reason for this might be that the respondents do not have a clear view of the SRM definition due to a lack of communication or due to a lack of perceived clarity of the definition. First and foremost, the definition should be communicated to understand what SRM means at the case company. Secondly, the case company could consider altering its definition of SRM. The SRM definitions found from the literature focus on one aspect only: development and management, communication and interaction, or activities. Currently, the definition of the case company focuses on the former but they also list three activities, yet the stakeholders highlight the midmost option. Evidently, a mutual understanding of the definition is needed.

Interoperability was the most important non-functional requirement, as 84 % of the respondents reported it during the interviews. The other two most important factors were usability (76 %) and data and information (48 %). In terms of the non-functional requirements, there were more distinct similarities among all the stakeholders than with the functional requirements. These findings indicate that the respondents often found it challenging to think about what the new system could be like and what functions it could have. Thus, they often took ideas from other systems they used or they concentrated on the shortcomings of the current system.

The suppliers stood out with their answers, as most of the functional and non-functional requirements had a value of 0 %. This was because the vast majority of the suppliers had security and compliance issues in using their customers' systems. I think that the problem here is not that the suppliers do not see the value in SRM and establishing closer relationships with their customers, rather the problem lies in data security. Most companies apply a one size fits all level of security to their data assets (Townsend, 2018). Naturally, companies hold valuable data about their businesses that could be utilized in several ways by other parties. Openly sharing this data would thus increase the value created for the other parties, but it would concurrently diminish the value of the data asset for the company producing the data (Schildt, 2020). However, according to Townsend (2018), only 5 % of data generated by companies is crucial to running the businesses. Hence, companies should identify and classify sensitive business data, as the value of different types of data assets vary considerably (Townsend, 2018). If the suppliers of the case company remain hesitant due to data security issues, it could ultimately restrict the benefits gained from having an SRM system and SRM practices in general.

Functional requirements constituted 43 % of all the requirements, while non-functional requirements constituted 57 % of them. Even though there is not a significant difference in the number of each type of requirement, these findings still support the notion that the respondents found it challenging to think about what functions the new system could have. Hence, instead of stepping out of the box and concretely thinking what features an SRM system should have, it was easier to come up with general non-functional requirements, such as usability and speed, that would apply to any modern system. The reason for this finding might be that the respondents did not focus on SRM system features specifically; instead they were more concerned about the basic shortcomings of the current system as a system and not specifically as an SRM system. This reason relates to the concept of design fixation, which refers to "*a blind, and sometimes counterproductive, adherence to a limited set of ideas*" (Jansson & Smith, 1991). Design fixation led the respondents to

be captivated by the current system and its limitations, which in turn led to a limited set of ideas revolving around fixing the shortcomings. Design fixation is common when a starting point is vague, what is possible is only partly known, and the context is not well understood (Person, 2019). All of these apply to the SRM system project, as the starting point was open, it was difficult for the respondents to think what is feasible to implement, and the context of SRM was not well understood as already described earlier in this subsection.

The system requirements were divided into must have, should have, and could have requirements. Must have requirements constituted 48 % of all the requirements, should have requirements formed 23 % of them, and 29 % were could have requirements. It was not surprising that the amount of must have requirements was the most significant. However, the more must have requirements there are, the more restrictions there are in terms of the suitable systems. The definition of a must have requirement was "*if the system does not fulfill the requirement, the case company will not buy the system*." However, only two candidates, A and E, fulfilled all the must have requirements. Candidate D did not fulfill two must have requirements, but it was nonetheless decided to shortlist. The other longlisted candidates that responded to the RFI did not comply with 3-29 must have requirements. Not complying with the must have requirements showed on the overall scores due to the weighted calculations, and the candidates were instead disqualified based on the total scores.

In addition to system requirements, supplier requirements are essential in any procurement process (e.g., Day & Barksdale, 1994; Monczka, Trent & Handfield, 2005; Smith, 2012; van Weele, 2010). The objective of the supplier selection is to define an order of preference among the potential suppliers (Osiro, Lima-Junior & Carpinetti, 2014). There are several criteria suggested to be considered in supplier selection, and the importance of each criterion varies from a company and a project to another (Bhutta & Huq, 2002). For this project, the following criteria were evaluated: costs, delivery performance, management capabilities, expertise, service

and support, warranty and claims policy, development capabilities, environmental regulation compliance, geographical location, financial capabilities, and relationship and communication with the supplier.

5.3 RQ3 – IT-Provider & System Selection

RQ3: *How to select the most suitable IT-provider and a system from multiple available alternatives?*

The selection phase comprises of three steps: longlisting, shortlisting, and the final selection. Initially, there were 20 candidates on the longlist, of which 18 was sent the RFI document because two candidates did not respond to the contact requests. 50 % of the candidates (9) responded to the RFI, and the other half withdrew due to unfit company size, i.e., too small or too big, compared to the case company. Internet search was the dominating source for finding candidates for the longlist. The second most candidates were longlisted through direct contacts of the IT-providers. However, these two were also the ones that lost the most candidates during the longlisting step, as the number of Internet search candidates reduced by 70 % (7) and direct contact candidates by 50 % (3).

The shortlist was comprised of scoring the RFI responses with a weighted scoring method. The resulting shortlist comprised of three candidates, two of which were discovered through direct contacts, and one was the current SRM system provider. Even though only 50 % (3) direct contact candidates responded to the RFI, the quality of their responses was outstanding as 2/3 made it to the shortlist. The current SRM system provider was initially intended to function as a benchmark and it was hypothesized to score low on the RFI. However, they provided surprisingly good responses as they were proposing a different, more suitable system for handling SRM.

To make the final decision, the shortlisted candidates held a pitch/demonstration meeting at the case company's premises. They were also requested to provide two reference companies using their system that would be willing to be interviewed regarding the system and supplier requirements. Demonstrations proved to be vital in selecting the most suitable alternative, as high scores based on the RFI did not translate into a successful demonstration. Indeed, the top three candidates based on the RFI had almost a reverse order after the demonstrations: from E, A, D to D, E, A.

Something that was also interesting regarding the demonstration scores was that many were ready to use systems A and E, even though they got low scores. However, I suspect that the participants were willing to use any system that was better than the current one, which would explain the answers. Something that could also explain this result would be the order of the demonstrations. Candidate E was the first to demonstrate, getting good scores for the willingness to use the system, even though the overall scores were low. In this case, the reference point was the current system, and the participants expressed to be willing to use candidate E's solution rather than the current one. The highest scoring candidate D was the second to demonstrate and candidate A was the last with the lowest scores. It might be that after candidate D, candidate A was seen to be relatively more inadequate than candidate D. Thus, the reference point for candidate A was not the current system, but candidate A's solution.

The reference interviews were all positive, which was not surprising, but they also did not provide much additional knowledge regarding the system or the IT-provider. Instead, the reference interviews were beneficial for understanding the potential benefits of SRM.

6 Conclusion

6.1 Summary & Theoretical Contribution

This thesis set out to answer the research problem of "*How should a company acquire an IT system?*". To help in answering the research problem, three RQs were derived regarding SRM benefits, RE, and IT-provider and system selection.

The topic of selecting an IT system for SRM that satisfies the procuring company's needs and requirements has not been holistically studied. There are studies about SRM activities, systems, and benefits, as well as procurement and IT procurement. However, these studies emphasize different SRM activities, and the proposed procurement processes also differ from one source to another. By addressing how to procure an SRM system, this thesis makes a relevant academic contribution to both SRM and IT procurement.

The research problem and questions were answered based on the literature review and empirical research. The preliminary IT procurement process model was comprised based on the IT procurement process by Wakeford (2012) and general procurement processes by van Weele (2010) and van der Valk & Rozemeijer (2009). The preliminary model was then put to the test through empirical research, which contributed to the preliminary IT procurement process that was refined based on the learnings and analysis. The refined model for the IT procurement process consists of three main steps, which are presented in Figure 6.1.

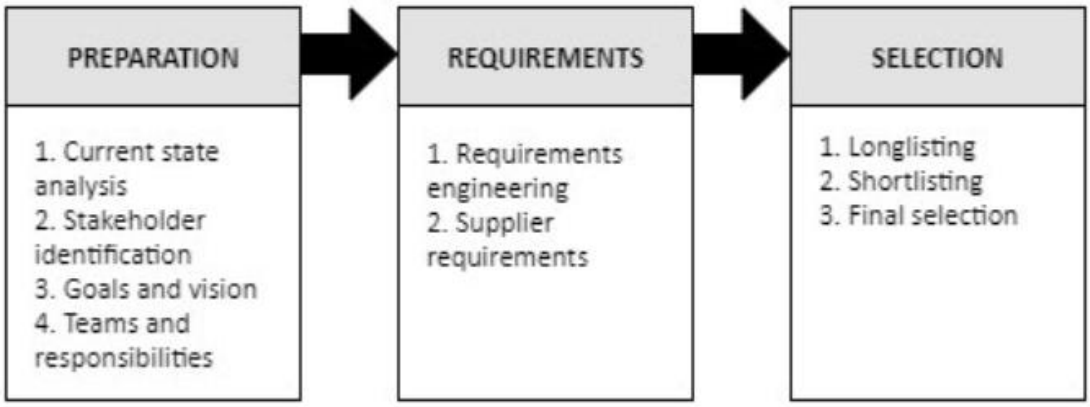

Figure 6.1 Refined IT procurement process model.

The preparation step consists of four sub-steps. The first sub-step is to conduct a current state analysis of the situation. This will motivate and highlight the need for a new system. The second sub-step is to identify the stakeholders, preferably by using a scientific method, such as the one suggested by Mitchell, Agle & Wood (1997). The stakeholders are the ones to be interviewed during the RE study, and they should participate in the demonstrations. The third sub-step is to define the high-level goals and vision for the new system with the stakeholders to understand what is wanted from the new system. The last sub-step is to form a steering group and a project team. The steering group is the ultimate body making the decisions while steering the IT procurement process. The project team should have a representative from each stakeholder group to speak for them. The project team assists in analyzing and validating the requirements during the RE study.

The requirements step is divided into two sub-steps: requirements engineering and supplier requirements. The requirements engineering study is conducted as the literature would suggest (e.g., Kotonya & Sommerville, 2002; Paetsch, Eberlein & Maurer, 2003; Sommerville & Sawyer, 2004), consisting of requirements elicitation, requirements analysis, requirements validation, requirements documentation, and requirements management. During requirements elicitation, the needs and requirements for the system are discovered by consulting the stakeholders through, e.g., interviews, surveys, and use cases. In the requirements analysis, the

requirements are prioritized and grouped, while any conflicts or vagueness are resolved. Requirements validation takes place iterative after every addition or modification to the system requirements. Moreover, requirements documentation and management take place concurrently with the three other activities.

Supplier requirements are essential in any procurement process (e.g., Day & Barksdale, 1994; Monczka, Trent & Handfield, 2005; Smith, 2012; van Weele, 2010). There are several supplier requirements that vary in importance from a case to another (Bhutta & Huq, 2002). The criteria reported in the literature can be used as a list from which to choose the most important supplier requirements for a specific case.

The last step in the refined IT procurement process model is the selection, which is divided into three sub-steps: longlisting, shortlisting, and the final selection. The longlist of candidates and their solutions are comprised of doing an Internet search, getting references from colleagues, and receiving direct contacts from IT-providers. Also, the current system provider could be included, at least as a benchmark. The longlisted candidates are sent an RFI document, which is comprised based on the system and supplier requirements. The requirements on the RFI should be objective, ensuring more reliable responses from the candidates. The RFI responses are then scored based on a selected scoring method and taking into account weights if there are any. The top-performing candidates are then shortlisted. The shortlisted candidates are then required to demonstrate their solution and provide at least one reference to make the final decision. During the demonstrations, subjective system requirements are evaluated. The references are for validating the perception of the system and the IT-provider, and to gather answers regarding subjective system and supplier requirements.

6.2 Managerial Implications

The research offered a generalizable model for IT procurement process, which is suitable to be applied when procuring IT-systems. I would suggest to try out the model when procuring another system to prove the model's applicability in general.

The research showed that RE is an essential prerequisite for procuring a system. RE highlights what is needed from the system, what are the requirements for it, and what is the importance of every requirement. By conducting a thorough RE before going ahead and contacting the potential IT-providers, the procuring organization can be confident that what is being procured is in line with the requirements. Also, when IT-providers directly contact someone in the organization about their offering, they do not precisely know what the organization wants. Thus, managers should be cautious in moving forward with an IT-provider based on direct contact if the needs and requirements are not yet precise.

Also, I would like to highlight the importance of having requirements not only regarding the system but also regarding the supplier. This was something that was highlighted in the procurement literature but interestingly not in the IT procurement literature. However, finding a suitable supplier is as essential as finding a suitable system. I would also point out that an RFI does not convey the whole truth regarding the system or the IT-provider. Hence, a demonstration is an essential part of selecting a system.

In this case, the results strongly implicate that the case organization should go forward with the SRM solution offered by candidate D. The next step would be to negotiate the terms and agree on the contract and then finally implement the system into use (Tate, 2015; Wakeford, 2012). According to Tate (2015), during the implementation phase, the responsibilities of the customer, i.e., the case company, include the following:

1. Monitor the delivery
2. Plan the project
3. Allocate resources
4. Manage expectations and change

In monitoring the delivery, the case company can refer back to the RFI and demo for a record of expectations. Even though the project relies heavily on IT-provider's performance, the customer is ultimately responsible for planning the project. Consequently, the case company is in charge of prioritization, staying in scope, and designing the final solution. The third point, allocating resources, includes gathering an implementation team, allocating project resources, and providing data for migration. Last, but certainly not least, the case company has to manage expectations and change. The SRM system creates possibilities for realizing benefits, but managing expectations and change determines whether these benefits are realized or not. Since this study provides the result for what is the best SRM system available for the case company and suggests that this system should be acquired through negotiation and contracting, the last hurdle is to implement the system successfully. For an implementation to be successful, communication and early stakeholder engagement are vital, since if the stakeholders feel that they are listened to, the implementation is more likely to be successful. (Tate, 2015)

6.3 Limitations

The main limitation of this thesis is that the gains are likely to be limited to procuring COTS solutions with some flexibility. If a company is procuring a system that is built from scratch or which has a considerable amount of flexibility, the proposed IT procurement process model will not fully function. These kinds of systems would at least require phases of building the system and testing it iteratively. Also, some IR procurement cases might not be as linear as the model suggests. It might be that a more thorough analysis is needed to select the candidates for the shortlist, or it might

be that the demonstrations in the final selection step are insufficient, and the shortlist of candidates might have to be revised.

It should be noted that the RE results of the research are limited to an SRM system and the case company, as needs and requirements are case-specific. However, some general requirements, such as usability and speed, are most probably relevant requirements for any modern system regardless of the system or the procuring company.

Another major limitation affecting the results is the stakeholders. Even though there were four identified stakeholder groups and representatives from different levels and countries, some stakeholders contributed more than the others. The stakeholders that contributed the most were the procurement and purchasing employees from Finland, and the ones with the least contribution were the suppliers, who were only considered through supplier surveys. Besides, when identifying the stakeholders, no scientific method was used for it, which might indicate that some relevant stakeholders were left out of the research.

The last limitation is regarding the demonstrations. The demonstration form had qualitative adjectives as response options, which might mean different things to different respondents. In hindsight, it might be better to have quantitative numbers, for example, from one to four as response options so that they are more universally understandable. Also, numbers would allow giving half scores, which were not possible with the qualitative response options, even though they were scored on a scale of one to four. However, it was not disclosed for the respondents what the qualitative response options stand for in scoring. Nevertheless, most of the respondents participated in every demonstration, which provided validity to the results.

6.4 Suggestions for Further Research

An interesting avenue for further research would be to investigate if the often-cited benefits of SRM and having a system to support SRM activities manifest in real life. However, it is notable that some benefits are more readily observable and linked to SRM than others. For example, deeper relationships and reduced risks can be more directly related to SRM, but the effects on cost savings and working capital are dependent on several factors, and they might be challenging to link to SRM. Besides, it should be investigated how to measure the benefits of implementing SRM practices and having an SRM system.

Another avenue for further research is regarding the demonstrations. It was unexpected that the participants (sub)consciously evaluated the overall performance of the candidate and what their perception or "feeling" of them was after the demonstration. It would be interesting to investigate further how these perceptions affect the overall scoring. Additionally, it might be that discussing with others affects the scoring. During the demonstrations, there was a short break during which the participants often discussed their perceptions so far. It could be interesting to study if talking to other participants affects the given scores.

References

Al-Abdallah, G. M., Abdallah, A. B. & Hamdan, K. B. 2014. *The Impact of Supplier Relationship Management on Competitive Performance of Manufacturing Firms*. International Journal of Business and Management. Vol. 9 (2). pp. 192-202. ISSN: 1833-3850.

Amaratunga, D., Baldry, D., Sarshar, M. & Newton, R. 2002. *Quantitative and Qualitative Research in the Built Environment: Application of "Mixed" Research Approach*. Work Study. Vol. 51 (1). pp. 17-31. ISSN: 0043-8022.

Amid, A., Ghodsypour, S. H. & O'Brien, C. 2006. *Fuzzy Multiobjective Linear Model for Supplier Selection in a Supply Chain*. International Journal of Production Economics. Vol. 104 (2). pp. 394-407. DOI: 10.1016/j.ijpe.2005.04.012.

Ashok, L. 2019. 8 Unique Phases of Supplier Lifecycle Management. Zycus Procurement Blog. [online], [cited 31.10.2019]. Available: https://www.zycus.com/blog/supplier-management/8-unique-phases-of-supplier-lifecycle-management.html.

Avison, D., Lau, F., Myers, M. & Nielsen, P. A. 1999. *Action Research*. Communication of the Association for Computing Machinery (ACM). pp. 94- 97. Vol. 42 (1). DOI: 10.1145/291469.291479.

Baskerville, R. L. 1997. *Distinguishing Action Research from Participative Case Studies*. Journal of Systems and Information Technology. Vol. 1 (1). pp. 25-45. ISSN: 1328-7265.

Bayazit, O. 2006. *Use of Analytic Network Process in Vendor Selection Decisions*. Benchmarking: an International Journal. Vol. 13 (5). pp. 566-579. DOI: 10.1108/14635770610690410.

Bemelmans, J., Voordijk, H., Vos, B. & Buter, J. 2012. *Assessing Buyer-Supplier Relationship Management: Multiple Case-study in the Dutch Construction Industry*. Journal of Construction Engineering and Management. Vol. 138 (1). pp. 163-176. ISSN: 0733-9364.

Bhutta, K. S. & Huq, F. 2002. *Supplier Selection Problem: A Comparison of the Total Cost of Ownership and Analytical Hierarchy Process Approaches*. Supply Chain Management: An International Journal. Vol. 7 (3). pp. 126-135. DOI: 10.1108/13598540210436586.

Bhuvaneswaran, S. 2019. Managing Supplier Lifecycle with Technology at Every Level. Kissflow Inc. [online], [cited 31.10.2019]. Available: https://kissflow.com/procurement-process/vendor-management/supplier-lifecycle-mgmt-steps/.

Campelo Filho, E. G. 2009. *Analysis of Current Supplier Relationship Management Practices: a Solution Proposal*. Dissertation. Germany: Karlsruhe Institute of Technology. pp. 234.

Cao, J., Cao, G. & Wang, W. 2012. *A Hybrid Model Using Analytic Network Process and Gray Relational Analysis for Bank's IT Outsourcing Vendor Selection*. Kybernetes. Vol. 41 (7). pp. 994-1013. DOI: 10.1108/03684921211257847.

Carr, A. S. & Pearson, J. N. 1999. *Strategically Managed Buyer-Supplier Relationships and Performance Outcomes*. Journal of Operations Management. Vol. 17 (5). pp. 497-519. DOI: 10.1016/S0272-6963(99)00007-8.

Chen, C-T., Lin, C-T. & Huang S-F. 2006. *A Fuzzy Approach for Supplier Evaluation and Selection in Supply Chain Management*. International Journal of Production Economics. Vol. 102 (2). pp. 289-301. DOI: 10.1016/j.ijpe.2005.03.009.

Chen, I. J. & Paulraj, A. 2004. *Towards a Theory of Supply Chain Management: the Constructs and Measurements*. Journal of Operations Management. Vol. 22 (2). pp. 119-150. DOI: 10.1016/j.jom.2003.12.007.

Chen, L. Y. & Wang, T-C. 2009. *Optimizing Partners' Choice in IS/IT Outsourcing Projects: The Strategic Decision of Fuzzy VIKOR*. International Journal of Production Economics. Vol. 120 (1). pp. 233-242. DOI: 10.1016/j.ijpe.2008.07.022.

Chepchumba Kosgei, R. & Gitau, R. 2016. *Effect of Supplier Relationship Management on Organizational Performance: a Case Study of Kenya Airways Limited*. International Academic Journal of Procurement and Supply Chain Management. Vol. 2 (2). pp. 134-148. ISSN: 2518-2404.

Coghlan, D. 2001. *Insider Action Research Projects: Implications for Practicing Managers*. Management Learning. Vol. 32 (1). pp. 49-60. DOI: 10.1177/1350507601321004.

Cooper, M. C., Lambert, D. M. & Pagh, J. D. 1997. *Supply Chain Management: More Than a New Name for Logistics*. The International Journal of Logistics Management. Vol. 8 (1). pp. 1-14. DOI: 10.1108/09574099710805556.

Croom, S., Romano, P. & Giannakis, M. 2000. *Supply Chain Management: an Analytical Framework for Critical Literature Review*. European Journal of Purchasing & Supply Management. Vol 6 (1). pp. 67-83. DOI: 10.1016/S0969-7012(99)00030-1.

Croxton, K. L., García-Dastugue, J., Lambert, D. M. & Rogers, D. S. 2001. *The Supply Chain Management Process*. The International Journal of Logistics Management. Vol. 12 (2). pp. 13-36. DOI: 10.1108/09574090110806271.

Dahlberg, T., Saarinen, T. & Mazurova, E. 2017. *Strategic Information Technology Management Fall 2017 Lecture 10*. Finland: Aalto University School of Business. pp. 44-54.

Daniels, J. D. & Cannice, M. V. 2004. *Interview Studies in International Business Research* in Marschan-Piekkari, R. & Welch, C. 2004. *Handbook of Qualitative Research Methods for International Business*. UK: Edward Elgar Publishing Limited. pp. 185-204. ISBN: 1 84542 434 4.

Day, E. & Barksdale, H. C. 2003. *Selecting a Professional Service Provider from the Short List*. The Journal of Business & Industrial Marketing. Vol. 18 (6). pp. 564-579: DOI: 10.1108/08858620310492428.

Day, E. & Barksdale, H. C. 1994. *Organizational Purchasing of Professional Services: The Process of Selecting Providers*. The Journal of Business & Industrial Marketing. Vol. 9 (3). pp. 44-51: ISSN: 0885-8624.

Easterby-Smith, M., Thorpe, R. & Jackson, P. 2012. *Management Research*. 4th edition. UK: SAGE Publications Ltd. pp. 16-35. ISBN: 978-0-85702-116-8.

Eisenhardt, K. 1989. *Building Theories from Case Study Research*. Academy of Management Review. Vol. 14 (4). pp. 532-550. DOI: 10.2307/258557.

Eisenhardt, K. & Graebner, M. 2007. *Theory Building from Cases: Opportunities and Challenges*. Academy of Management Journal. Vol. 50 (1). pp. 25-32. DOI: 10.5465/AMJ.2007.24160888.

Ellram, L. M. 1990. *The Supplier Selection Decision in Strategic Partnerships*. Journal of Purchasing and Materials Management. pp. 8-14. Vol. 26 (4). DOI: 10.1111/j.1745-493X.1990.tb00515.x.

EY Global. 2018. *Ten Trends Shaping the Future of Procurement*. [online], [cited 7.10.2019]. Available: https://www.ey.com/en_gl/advisory/ten-trends-shaping-the-future-of-procurement.

Ghauri, P. 2004. *Designing and Conducting Case Studies in International Business Research* in Marschan-Piekkari, R. & Welch, C. 2004. *Handbook of Qualitative Research Methods for International Business*. UK: Edward Elgar Publishing Limited. pp. 109-124. ISBN: 1 84542 434 4.

Gunasekaran, A. & Ngai, E. W. T. 2004. *Information Systems in Supply Chain Integration and Management*. European Journal of Operational Research. Vol. 159. pp. 269-295. DOI: 10.1016/j.ejor.2003.08.016.

Hardy, S. 2017. *Supplier Relationship Management Delivers the Secret Sauce for Paint and Coatings Businesses*. Paint & Coatings Industry (PCI) Magazine. [online], [cited 10.10.2019]. Available: https://www.pcimag.com/articles/103868-supplier-relationship-management.

Heikkilä, J., Vuori, M. & Laine, J. A. T. 2013. *Purchasing Business Services*. Finland: The Federation of Finnish Technology Industries. pp. 182. ISBN: 978-952-238-114-9.

Helou, M. M. & Caddy, I. N. 2006. *Definition Problems and a General Systems Theory Perspective in Supply Chain Management*. Problems and Perspectives in Management. Vol. 4 (4). pp. 77-83. ISSN: 1727-7051.

Herrmann, J. & Hodgson, B. 2001. *SRM: Leveraging the Supply Base for Competitive Advantage*. Proceedings of the SMTA International Conference. Chicago, Illinois, USA. pp. 5.

Hirsijärvi, S., Remes, P. & Sajavaara, P. 2009. *Tutki ja kirjoita*. 15th edition. Finland: Kustannusosakeyhtiö Tammi. pp. 464. ISBN: 978-951-31-4836-2.

Jansson, D. G. & Smith, S. M. 1991. *Design Fixation*. Design Studies. Vol. 12 (1). pp. 3-11. DOI: 10.1016/0142-694X(91)90003-F.

Järvenpää, E. & Kosonen, K. 1997. *Johdatus tutkimusmenetelmiin ja tutkimuksen tekemiseen*. Finland: Libella Painopalvelu Oy. pp. 103. ISSN: 1239-4858.

Kar, A. K. & Pani, A. K. 2014. *Non-Contradictable Value Creation in Buyer-Supplier Networks: A Case Study*. International Journal of Procurement Management. Vol. 7 (5). pp. 493-507.

Karpak, B., Kumcu, E. & Kasuganti, R. R. 2001. *Purchasing Materials in the Supply Chain: Managing a Multi-Objective Task*. European Journal of Purchasing & Supply Management. Vol. 7 (3). pp. 209-216. DOI: 10.1016/S0969-7012(01)00002-8.

Kaul, M., Feng, J. B. & Mathiassen, L. 2012. *A Semantic Sense & Respond Approach to IT-Enabled Buyer-Supplier Relationship Management: An Action Research Study*. International Journal of Business Information Systems. Vol. 5 (4). pp. 3436-3444. DOI: 10.1504/IJBIS.2017.10005616.

Kotonya, G. & Sommerville, I. 2002. Reprinted October 2002. *Requirements Engineering: Processes and Techniques*. UK: John Wiley & Sons Ltd. pp. 282. ISBN: 0-471-97208-8.

Kujala, S. 2008. *Effective User Involvement in Product Development by Improving the Analysis of User Needs*. Behaviour and Information Technology. Vol. 27 (6). pp. 457-473. DOI: 10.1080/01449290601111051.

Lambert, D. M. & Schwieterman, M. A. 2012. *Supplier Relationship Management as a Macro Business Process*. Supply Chain Management: An International Journal. Vol. 17 (3). pp. 337-352. ISSN: 1359-8546.

Lee, R. 1998. *An Enterprise Decision Framework for Information System Selection*. Information Systems Management. Vol. 15 (4). pp. 7-13.

Lee, D., Kang, S., Lee, S-k., Kim, Y-g. & Lee, S-g. 2007. *BestChoice SRM: A Simple and Practical Supplier Relationship Management System for e-Procurement*. Republic of Korea: School of Computer Science and Engineering, Seoul National University and the Ministry of Information & Communications. pp. 12.

LeMay, S., Helms, M. M., Kimball, B. & McMahon, D. 2017. *Supply Chain Management: The Elusive Concept and Definition*. The International Journal of Logistics Management. Vol. 28 (4). pp. 1425-1453. ISSN: 0957-4093.

Li, M., Jin, L. & Wang, J. 2014. *A New MCDM Method Combining QFD with TOPSIS for Knowledge Management System Selection from the User's Perspective in Intuitionistic Fuzzy Environment*. Applied Software Computing. Vol. 21. pp. 28-37. DOI: 10.1016/j.asoc.2014.03.008.

Makkonen, H. & Vuori, M. 2014. *The Role of Information Technology in Strategic Buyer-Supplier Relationships*. Industrial Marketing Management. Vol. 43 (6). pp. 1053-1062. DOI: 10.1016/j.indmarman.2014.05.018.

Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D. & Zacharia, Z. G. 2001. *Defining Supply Chain Management*. Journal of Business Logistics. Vol. 22 (2). pp. 1-25. DOI: 10.1002/j.2158-1592.2001.tb00001.x.

Mettler, T. & Rohner, P. 2009. *Supplier Relationship Management: A Case Study in the Context of Health Care*. Journal of Theoretical and Applied Electronic Commerce Research. Vol. 4 (3). ISSN: 0718-1876.

Mishra, R. K. 2007. *Basics of Supply Chain Management* in Dubey, J. & Kumar, M. L. S. 2007. *Supply Chain Management*. India: New Century Publications. pp. 1-15. ISBN: 978-81-7708-142-8.

Mitchell, R. K., Agle, B. R. & Wood, D. J. 1997. *Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts*. Academy of Management Review. Vol. 22 (4). pp. 853-886. DOI: 10.2307/259247.

Moeller, S., Fassnacht, M. & Klose, S. 2006. *A Framework for Supplier Relationship Management (SRM)*. Journal of Business-to-Business Marketing. Vol. 13 (4). pp. 69-94. DOI: 10.1300/J033v13n04_03.

Monczka, R. M., Trent, R. J. & Handfield, R. B. 2005. *Purchasing and Supply Chain Management*. 3rd edition. USA: South-Western, Thompson Corporation. pp. 744. ISBN: 0-324-22419-2.

Neely, A., Gregory, M. & Platts, K. 1995. *Performance Measurement System Design: A Literature Review and Research Agenda*. International Journal of Operations & Production Management. Vol. 15 (4). pp. 80-116. ISSN: 0144-3577.

Nickson, D. 2008. *IT Procurement Handbook for SMEs*. UK: British Informatics Society Limited. pp. 201. ISBN: 9781902505985.

Nix, N. W. 2001. *Purchasing in a Supply Chain Context* in Mentzer, J. T. 2001. *Supply Chain Management*. USA: SAGE Publications, Inc. pp. 205-235. ISBN: 0-7619-2111-7.

Osiro, L., Lima-Junior, F. R. & Carpinetti, L. C. R. 2014. *A Fuzzy Logic Approach to Supplier Evaluation for Development*. International Journal of Production Economics. Vol. 153. pp. 95-112. ISSN: 0925-5273.

Oztaysi, B. 2014. *A Decision Model for Information Technology Selection Using AHP Integrated TOPSIS-Grey: The Case of Content Management Systems*. Knowledge-Based Systems. Vol. 70. pp. 44-54. DOI: 10.1016/j.knosys.2014.02.010.

Paetsch, F., Eberlein, A. & Maurer, F. 2003. *Requirements Engineering and Agile Software Development*. Proceedings of the 12th IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises (WETICE'03). pp. 308-313. DOI: 10.1109/ENABL.2003.1231428.

Park, D. & Krishnan, H. A. 2001. *Supplier Selection Practices Among Small Firms in the United States: Testing Three Models*. Journal of Small Business Management. Vol. 39 (3). pp. 259-271. DOI: 10.1111/0447-2778.00023.

Park, J., Shin, K., Chang, T-W. & Park, J. 2010. *An Integrative Framework for Supplier Relationship Management*. Industrial Management & Data Systems. Vol. 110 (4). pp. 495-515. DOI: 10.1108/02635571011038990.

Person, O. 2019. *Design & Creativity in Business 2018/2019: Design Thinking & Problem Framing*. Lecture at Aalto University, 6.5.2019. Available in the MyCourses system.

PricewaterhouseCoopers (PwC). 2013. *Supplier Relationship Management – How Key Suppliers Drive Your Company's Competitive Advantage*. [online], [cited 11.10.2019]. Available: https://www.pwc.nl/nl/assets/documents/pwc-supplier-relationship-management.pdf.

PSK 8404. 2015. *Supplier Assessment Questionnaire*. Finland: PSK Standards Association. pp. 17.

Qiu, X., Cao, L., Li, P. & Zhao, L. 2013. *A Trust Evaluation Method for Supplier Selection*. 12th IEEE International Conference on Trust, Security and Privacy in Computing and Communication. pp. 1498-1503. DOI: 10.1109/TrustCom.2013.182.

Radell, C. & Schannon, D. 2018. *Digital Procurement: The Benefits Go Far Beyond Efficiency*. Bain & Company. [online], [cited 7.10.2019]. Available: https://www.bain.com/insights/digital-procurement-the-benefits-go-far-beyond-efficiency/.

Remenyi, D., Williams, B., Money, A. & Swartz E. 1998. *Doing Research in Business and Management: An Introduction to Process and Method*. UK: SAGE Publications Ltd. pp. 309. ISBN: 0 7619 5949 1.

Robson, C. 2002. *Real World Research*. 2nd edition. UK: Blackwell Publishers Ltd. pp. 599. ISBN: 0-631-21305-8.

Ruhi, U. & Turel, O. 2005. *Driving Visibility, Velocity and Versatility: The Role of Mobile Technologies in Supply Chain Management*. Journal of Internet Commerce. Vol. 4 (3). pp. 95-117. DOI: 10.1300/J179v04n03_06.

Runeson, P. & Höst, M. 2009. *Guidelines for Conducting and Reporting Case Study Research in Software Engineering*. Empirical Software Engineering. Vol. 14. pp.131-164. DOI: 10.1007/s10664-008-9102-8.

Saad, S. M., Kunhu, N. & Mohamed, A. M. 2016. *A Fuzzy-AHP Multi-Criteria Decision Making Model for Procurement Process*. International Journal of Logistics Systems and Management. Vol. 23 (1). pp. 1-24. DOI: 10.1504/IJLSM.2016.073295.

Schiessl, M. & Duda, S. 2007. *A Qualitative Oriented Study about IT Procurement Processes: Comparison of 4 European Countries*. UI-HCII'07 Proceedings of the 2nd International Conference on Usability and Internationalization. Beijing, China. pp. 606-614. ISBN: 978-3-540-73286-0.

Schildt, H. 2020. *Data Imperative - Chapter 4: Complexity and Modularity*. Unpublished book. pp. 22.

Schuh, C., Strohmer, M. F., Easton, S., Hales, M. & Triplat, A. 2014. *Supplier Relationship Management: How to Maximize Vendor Value and Opportunity*. US: Apress Media LLC. pp. 192. ISBN: 978-1-4302-6260-2.

Smith, P. 2012. *Supplier Lifecycle Management: Reduce Risk, Improve Performance and Drive Supplier Value*. Spend Matters UK/Europe. [online], [cited 31.10.2019]. Available: http://spendmatters.com/uk/supplier-lifecycle-management/.

Soares, C., Batista, F. & Ribeiro, R. 2017. *A Simplified Method to Enhance the Analysis for New Information System in Corporate Environments*. 2017 12th Iberian Conference on Information Systems and Technologies (CISTI). Lisbon, Portugal. pp. 619-622. DOI: 10.23919/CISTI.2017.7975905.

Sommerville, I. & Sawyer, P. 2004. Reprinted June 2004. *Requirements Engineering: A Good Practice Guide*. UK: John Wiley & Sons Ltd. pp. 391. ISBN: 0-471-97444-7.

Stock, J. R. & Boyer, S. L. 2009. *Developing a Consensus Definition of Supply Chain Management: A Qualitative Study*. International Journal of Physical Distribution & Logistics Management. Vol. 39 (8). pp. 690-711. ISSN: 0960-0035.

Stump, R. L. & Sriram, V. 1997. *Employing Information Technology in Purchasing: Buyer-Supplier Relationships and Size of the Supplier Base*. Industrial Marketing Management. Vol. 26 (2). pp. 127-136. ISSN: 0019-8501.

Susman, G. I. & Evered, R. D. 1978. *An Assessment of the Scientific Merits of Action Research*. Administrative Science Quarterly. Vol. 23 (4). pp. 582-603. DOI: 10.2307/2392581.

Sweeney, E. 2011. *Towards a Unified Definition of Supply Chain Management: The Four Fundamentals*. International Journal of Applied Logistics. Vol. 2 (3). pp. 30-48. DOI: 10.4018/jal.2011070103.

Tate, M. 2015. *Off-the-Shelf IT Solutions: A Practitioner's Guide to Selection and Procurement*. UK: The Chartered Institute for IT. pp. 265. ISBN: 978-1-78017-260-6.

Townsend, K. 2018. *Knowing Value of Data Assets is Crucial to Cybersecurity Risk Management*. Wired Business Media. [online], [cited 4.2.2020]. Available: https://www.securityweek.com/knowing-value-data-assets-crucial-cybersecurity-risk-management.

Yin, R. K. 2003. *Case Study Research: Design and Methods*. 3rd edition. UK: SAGE Publications Ltd. pp. 183. ISBN: 0-7619-2553-8.

van der Valk, W. & Rozemeijer, F. 2009. *Buying Business Services: Towards a Structured Service Purchasing Process*. Journal of Services Marketing. Vol. 23 (1). pp. 3-10. ISSN: 0887-6045.

van Weele, A. J. 2010. *Purchasing and Supply Chain Management: Analysis, Strategy, Planning and Practice*. 5th edition. UK: Cengage Learning EMEA. pp. 418. ISBN: 978-1-4080-1896-5.

Verma, R. & Pullman, M. E. 1998. *An Analysis of the Supplier Selection Process*. International Journal of Management Science. Vol. 26 (6). pp. 739-750. DOI: 10.1016/s0305-0483(98)00023-1.

Wagner, S. M. & Essig, M. 2006. *Electronic Procurement Applications and Their Impact on Supplier Relationship Management*. International Journal of Services Technology and Management. Vol. 7 (5/6). pp. 439-462. DOI: 10.1504/IJSTM.2006.011286.

Wakeford, J. 2012. *Selection Management: For Systems and Services.* UK: IT Governance Publishing. pp. 105. ISBN: 978-1-84928-427-1.

Weber, C. A., Current, J. R. & Benton, W. C. 1991. *Vendor Selection Criteria and Methods*. European Journal of Operational Research. Vol. 50 (1). pp. 2-18. DOI: 10.1016/0377-2217(91)90033-R.

Wu, I-L. & Shen, Y-C. 2006. *A Model for Exploring the Impact of Purchasing Strategies on User Requirements Determination of e-SRM*. Information & Management. Vol. 43 (4). pp. 411-422. DOI: 10.1016/j.im.2004.11.004.

Zalan, T. & Lewis, G. 2004. *Writing About Methods in Qualitative Research: Towards a More Transparent Approach* in Marschan-Piekkari, R. & Welch, C. 2004. *Handbook of Qualitative Research Methods for International Business*. UK: Edward Elgar Publishing Limited. pp. 507-528. ISBN: 1 84542 434 4.

Appendices

A Interview Questions

** Introduction **

** Warm-up **

1. Tell me about your regular day.
2. What tasks/projects are you responsible of?
3. With whom do you work with and what systems do you use on your computer?
4. How would you describe supplier relationship management (SRM) in your own words?

** Main body of interview **

5. What do you do with the current SRM tool?
6. What would you want to be able do with the upcoming system?
7. What features of the current system do you use and how?
8. What problems prevent you from completing your tasks in the current system?
9. Do you have a certain way of resolving the problems you face in the current system?
10. How would you want to resolve the problems in the upcoming?
11. Does something else cause problems in the current system?
12. What stages of the current system would you improve and why?
13. What are the shortcomings of the current system and why?
14. What ideas do you have for the new system?
15. What subjects related to the SRM tool project do you talk about with your colleagues?
16. What do you have to do manually at this time that you would like to have automated?
17. What aspects are missing from the current system at this time?

18. To what systems should the upcoming SRM tool be integrated?

** Cool-off **

19. How would you describe a successful and well-functioning system? What aspects should it at least have?
20. What else would you like me to ask? Would you like to add something?

** Closure **

21. Can I contact you if any further questions arise?

B Supplier Questionnaire

1. How would you describe supplier relationship management (SRM)?

Clarification: Basically, we want to know your opinion on the relationship between you and us. How could we improve in handling the relationship and communication (through an SRM tool)?

Answer:

2. What would you want to be able do with the upcoming SRM tool?

Clarification: What would you want to do in the toll in order to improve our relationship and communication? For example, would you want to upload information? What information?

Answer:

3. When using systems in general, what problems prevent you from completing your tasks?

Clarification: For example, slow system, system crash…

Answer:

4. Do you have a certain way of resolving these problems? How would you want to resolve these problems instead?

Clarification: Relating to question number 3.

Answer:

5. What do you have to do manually at this time that you would like to have automated?

Clarification: Something related to our relationship and communication that you currently have to do manually.

Answer:

6. To what systems should the upcoming SRM tool be integrated?

Clarification: Is there a system used in your organization that you think should be integrated to the upcoming SRM tool? What is the system? Why should the systems be integrated?

Answer:

7. Do you have an SRM system you use with your suppliers?

Clarification: If yes, could you give the name of the system provider and briefly explain what matters are taken care of in the system?

Answer:

8. Would you be willing to use an SRM system with us? Explain briefly.

Answer:

9. How would you describe a successful and well-functioning system in general?

Clarification: Think about a system on your computer or even a mobile application. What is your favourite system/application? Why do you enjoy using it?

Answer:

10. Would you like to add something? Or do you have any questions?

Answer:

11. Can I contact you if any further questions arise?

Answer:

C RFI Questions, Supplier Criteria

** COSTS **

1. Provide an estimation of costs for 50 users including licenses, implementation, on-going support and maintenance, and other likely costs.
2. Provide an estimation of costs for optional modules (e.g., e-procurement) if you see those fit to our needs.
3. Is there a history of cost price changes regarding your solution?

** DELIVERY PERFORMANCE **

4. Estimate how long would it take to implement the solution.

** MANAGEMENT CAPABILITIES & EXPERTISE **

5. How would you manage the project on your part?
6. What would you consider to be your expertise?

** SERVICE & SUPPORT **

7. Are you providing support for the solution?
8. Are you providing training for the solution?
9. What is your response time for support?

** WARRANTY & CLAIMS POLICY **

10. Do you provide warranty?
11. Do you have an incident/ticketing/claims process in place and available to use for reporting issues?

** FLEXIBILITY **

12. Is the solution flexible to changes?
13. Do you provide additional modules that might interest us (e.g., e-procurement)?

** DEVELOPMENT CAPABILITIES **

14. What plans do you have for the solution's future development and upgrades?

** ENVIRONMENTAL REGULATION COMPLIANCE**

15. Would you be able to comply to our Supplier Code of Conduct?

D Demonstration Form

The purpose of this questionnaire is to collect information on your experience of the demonstration of the prospective system.

Please be honest and specific in your answers. Leave your name blank if you prefer to stay anonymous.

Date of demonstration: _____

Demonstration candidate: _____

	Question	**Response (please circle a response).**			
A	**Process:** Did the demonstration allow sufficient time to view the system?	Inadequate	Acceptable	Good	Excellent
B	**Process:** Do you believe the demonstration gave an accurate view of the system?	Inadequate	Acceptable	Good	Excellent
C	**System:** What is your initial view on the usability of the system?	Inadequate	Acceptable	Good	Excellent
D	**System:** What is your initial view on the intuitiveness of the system? Is the system logical to use?	Inadequate	Acceptable	Good	Excellent
E	**System:** What is your initial view on the structuring of the information in the system? Is it clear or logical?	Inadequate	Acceptable	Good	Excellent
F	**System:** What is your initial view on the speed of the system? How fast does the system work?	Inadequate	Acceptable	Good	Excellent

G	**System:** What is your initial view on the visuality of the system?	Inadequate	Acceptable	Good	Excellent
H	**System:** What is your initial view on the flexibility of the system?	Inadequate	Acceptable	Good	Excellent
I	**System:** What is your initial view on the degree of automation of the system? Would it decrease manual work?	Inadequate	Acceptable	Good	Excellent
J	**System:** What is your initial view on how streamline the processes (e.g., claims handling) are in the system?	Inadequate	Acceptable	Good	Excellent
K	**Suitability:** Do you believe as an *individual* you could use this system?		No	Yes	
L	**Suitability:** Do you believe your *organization* could use this system?		No	Yes	
M	**Other comments**				

E Reference Interview Questions

The purpose of this document is to get a reference regarding a supplier relationship management (SRM) system provided by _____. We are also evaluating the capabilities of the system provider, and what often cited benefits of SRM practices and using an SRM system you have noticed if any.

SRM System:

1. How reliable would you consider the system? E.g., have there been issues with accessing the system or system crashes?

Answer:

2. How flexible would you consider the system? Has it been possible to make changes to the system according to your specific needs?

Answer:

3. What is your view on the usability (i.e., “user-friendliness”) of the system?

Answer:

4. What is your view on the intuitiveness of the system? Is the system logical to use?

Answer:

5. What is your view on the structuring of the information in the system? Is it clear and logical?

Answer:

6. What is your view on the speed of the system? How fast does the system work?

Answer:

7. What is your view on the visuality of the system (overall and in terms of data visualizations)?

Answer:

8. What is your view on the automation that the system provides? Did it decrease manual work?

Answer:

9. How streamline do you think the processes are in the system (e.g., uploading or downloading information, searching and sorting information, claims handling, supplier evaluation, etc.)?

Answer:

Supplier Capabilities:

1. Did the realized costs differ from the estimated costs?

Answer:

2. Did the realized implementation schedule differ from the estimated schedule?

Answer:

3. How would you describe the serviceability and support of the system provider? Are you content with the level of service and support you are provided with?

Answer:

4. How would you describe your relationship and communication with the system provider?

Answer:

5. How would you describe the system provider's management capabilities during the implementation process?

Answer:

6. How would you describe the claims process (ticketing) of the system provider? If there is an issue with the system, do you get help promptly?

Answer:

SRM Benefits:

The following list contains some often cited benefits of having systematic SRM practices in place. Please provide an answer if you have experienced any of the following benefits.

Benefit	**Response (please highlight your response).**			
Cost savings	I prefer not to answer.	No.	Cannot be certain.	Yes.
Improved financial performance	I prefer not to answer.	No.	Cannot be certain.	Yes.
Reduced risks	I prefer not to answer.	No.	Cannot be certain.	Yes.
Reliable supply	I prefer not to answer.	No.	Cannot be certain.	Yes.
Innovations	I prefer not to answer.	No.	Cannot be certain.	Yes.
Reduced working capital	I prefer not to answer.	No.	Cannot be certain.	Yes.
Prevent reputation damage	I prefer not to answer.	No.	Cannot be certain.	Yes.
Shorten time-to-market	I prefer not to answer.	No.	Cannot be certain.	Yes.
Improved product quality	I prefer not to answer.	No.	Cannot be certain.	Yes.

More efficient and streamlined processes	I prefer not to answer.	No.	Cannot be certain.	Yes.
Better contracts and deals	I prefer not to answer.	No.	Cannot be certain.	Yes.
Better responsiveness to customer needs	I prefer not to answer.	No.	Cannot be certain.	Yes.
Competitive advantage	I prefer not to answer.	No.	Cannot be certain.	Yes.

SRM System Benefits:

The following list contains some often cited benefits of having an SRM system. Please provide an answer if you have experienced any of the following benefits.

Benefit	**Response (please highlight your response).**			
Coordinates and automates communication.	I prefer not to answer.	No.	Cannot be certain.	Yes.
All supplier information in one centralized place.	I prefer not to answer.	No.	Cannot be certain.	Yes.
On-going monitoring of supplier and their performance.	I prefer not to answer.	No.	Cannot be certain.	Yes.
Automates purchasing/procurement activities, which increases efficiency.	I prefer not to answer.	No.	Cannot be certain.	Yes.
Mitigates risks.	I prefer not to answer.	No.	Cannot be certain.	Yes.
Increases transparency.	I prefer not to answer.	No.	Cannot be certain.	Yes.
Accurate and timely information.	I prefer not to answer.	No.	Cannot be certain.	Yes.